NORTH STOCKTON WASTEWATER FACILITY PLAN

for

City of Stockton, California

DECEMBER 1973

CH2M HILL

CORNELL, HOWLAND, HAYES & MERRYFIELD
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[Clair A. Hill and assoc]
[Stockton, City manager]
Sewage disposal Stockton
under treatment "

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28 December 1973

M-1001.01

Mr. Elder Gunter
City Manager
City of Stockton
City Hall
Stockton, California 95202

Dear Mr. Gunter:

We are pleased to submit our Facility Report for providing sewage treatment and disposal for the North Stockton area, together with the information necessary to demonstrate the merits of the proposed project. Our analysis includes the study of several alternatives, including continuation of existing facilities, for providing sewage service for the projected 1995 population in the project area.

Construction of the proposed North-South Interceptor is the most economical means of accomplishing the necessary service and entails the least environmental and social impacts associated with natural growth.

The courtesy and assistance received from the City and County staffs was most helpful and sincerely appreciated. Their cooperation enabled us to meet a very tight schedule while at the same time keeping costs to a minimum.

This report was prepared in accordance with State guidelines for agencies seeking clean water grants and should be submitted to the State as the Facility Plan for 87-1/2% funding of the estimated $6 million proposed North-South Interceptor sewer.

Sincerely,

Robert D. Harding

Robert D. Harding
Division Manager, Utilities

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SUMMARY

The City of Stockton and the surrounding metropolitan area are located near the San Joaquin River in the Central Valley, approximately 50 miles south of Sacramento. Public sewerage facilities were first provided by the City in 1893, and since that time have been expanded to serve more than 150,000 people.

Historically, City growth has been most active north of the Calaveras River, a factor which, over the years, prompted construction of the City's North Treatment Plant and the County's Lincoln Village Treatment Plant to handle the growing volume of sewage. These two plants currently serve 36,000 people, but continued northerly growth is expected to raise population totals north of the river to 109,000 by 1995.

Primarily as a result of new waste discharge requirements mandated by the Central Valley Regional Water Quality Control Board, the City of Stockton is in the process of expanding and upgrading its Main Water Quality Control Plant to an advanced waste treatment facility with a 55-million-gallon per day capacity. The same discharge restrictions are being placed on the City's North Plant and the County's Lincoln Village Plant as of December 1976.

With the goal of meeting discharge requirements, maintaining water quality in the east Delta, and improving the regional environment, the City of Stockton has engaged CH2M HILL, engineering consultants, to determine the most cost-effective project for providing sewage service to the North Stockton area.

Analysis of economic, environmental, and social considerations proves consolidation of wastewater treatment at the City's

Main Water Quality Control Plant is by far the most cost-effective treatment system.

Numerous alternatives were considered, ranging from "no action" to complete abandonment of all existing wastewater facilities and construction of a new super regional plant. Only three of these alternatives were capable of meeting desired objectives:

Alternative I - Lincoln Village - North Treatment Plant

This alternative proposes to upgrade and expand the existing treatment facilities in the North Stockton area to provide a tertiary degree of treatment to conform with proposed discharge requirements.

Alternative II - North Treatment Plant

This alternative proposes turning the existing North Treatment Plant into a north area regional facility by expanding, upgrading, and adding tertiary capabilities. The Lincoln Village Plant would be abandoned.

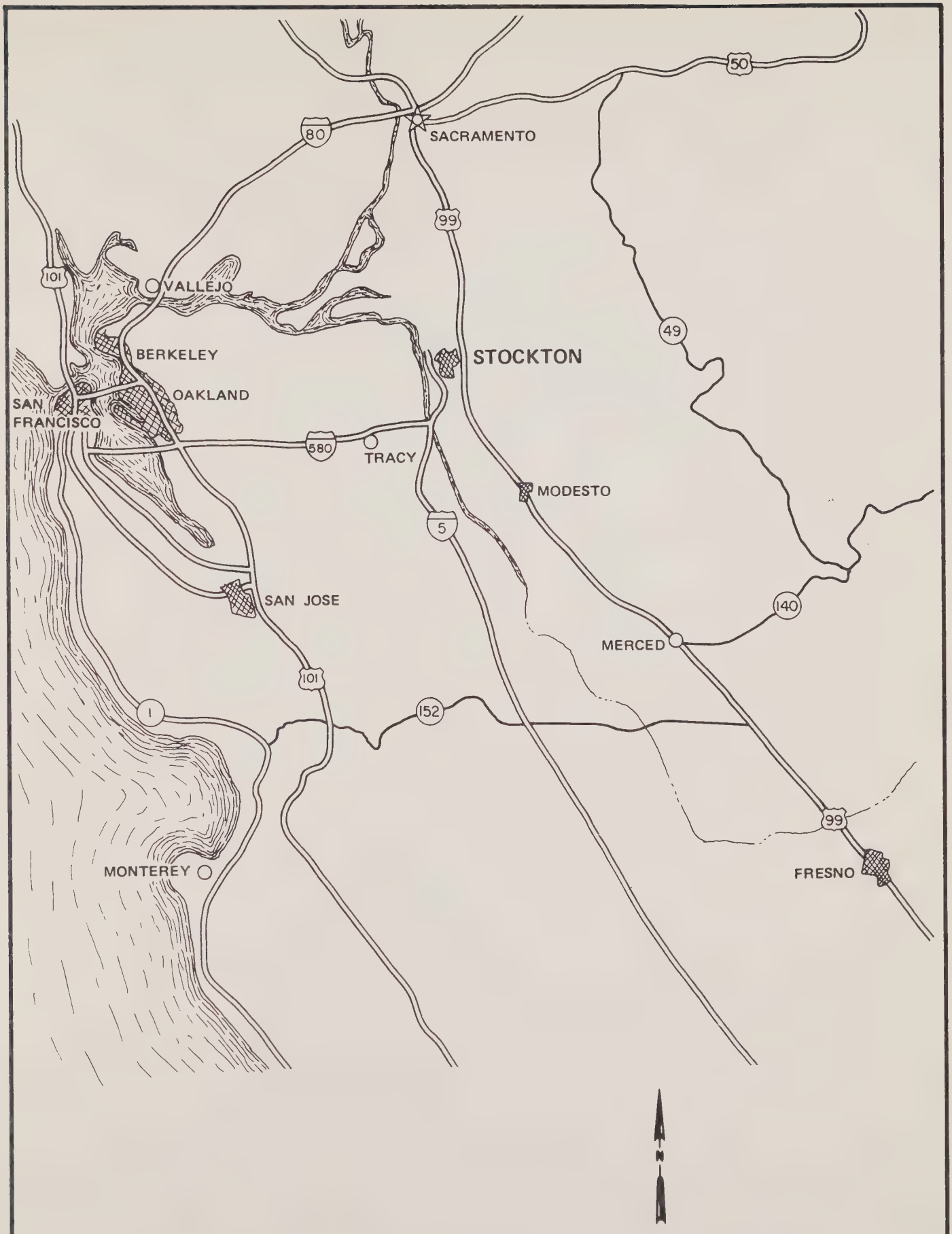
Alternative III - North-South Interceptor

This alternative would abandon both North area plants, construct a major interceptor from North Stockton to the City's Main Water Quality Control Plant, and consolidate treatment of all North Stockton wastes at that single regional plant. This alternative is shown on the following project map. The project would include approximately 6 miles of interceptor sewer, a new pumping station (29 mgd) at the Old Smith's Canal site, and a storm sewer, infiltration-inflow reduction system, for a total project cost of $6 million.

Initial capital costs are comparable for all three alternatives, but the interceptor alternative will have substantially lower operation and maintenance costs, making it economically superior. The interceptor also assures the least impact on the physical and social environment, provides the greatest protection against degradation of receiving waters, and offers optimum reduction of nuisance treatment plant odors. In addition, there is currently sufficient capacity at the MWQCP for the existing North Stockton flows.

This report was prepared according to State Clean Water and Environmental Protection Agency guidelines issued 11 October 1973, pertaining to applications for 87-1/2% grant funds for fiscal year 1973-74.

We recommend the City of Stockton propose to construct the favored project and submit this Facility Plan to the State and EPA for eligible funding.



NORTH STOCKTON WASTEWATER
FACILITY PLAN
VICINITY MAP

CH2M HILL


Five Mile Creek
NORTH PUMP STATION
NORTH STP
Fourteenmile Slough
LINCOLN VILLAGE STP
PROPOSED INTERCEPTOR
INTERSTATE 5
N
NORTH STOCKTON WASTEWATER FACILITY PLAN PROJECT MAP
San Joaquin River
Calaveras River
SMITH'S CANAL PUMP STATION
Smith's Canal
LEGEND
NEW FORCE MAIN
NEW GRAVITY MAIN
EXISTING FORCE MAIN
EXISTING GRAVITY MAIN
PROPOSED INTERCEPTOR
San Joaquin River
MAIN WATER QUALITY CONTROL PLANT
CH2M HILL

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I. INTRODUCTION

A. BACKGROUND

Sewage treatment in the Stockton area has historically progressed to meet the immediate demands of rapid City growth since the first sewage bond financed construction of the old Smith's Canal Sewage Treatment Plant in 1918. Repeated sewage system overloads and failures accompanied population and industrial growth over the years, making plant additions and augmentation necessary for the public health.

In 1922, the South Plant, now called the Main Water Quality Control Plant (MWQCP), was constructed adjacent to the San Joaquin River. At that time, both plants provided only fine screening and City growth soon began straining their capacity. In 1936, general funds were used to upgrade both plants to provide primary sedimentation.

With the industrial growth of World War II, excessive loadings again became a problem, causing receiving waters in the San Joaquin River and Stockton Ship Channel to pose a health hazard. In 1945, a study was conducted which called for the installation of secondary treatment facilities at both plants. Only the MWQCP, however, was upgraded at that time.

When post-war growth began in the Lincoln Village area, the City was unable to provide sewage treatment. To meet the need, the County constructed a treatment plant at the west end of Swain Road to discharge into the upper end of Fourteen-Mile Slough. Growth in Pacific Gardens led to the establishment of another district and construction of conveyance facilities to tie into the Lincoln Village Plant.

Annexations soon extended the City's Smith's Canal Treatment Plant service area to the Calaveras River, causing serious overloads at that plant.

In 1955, another study recommended construction of a new plant to process Smith's Canal sewage. It also called for relief sewers to reduce the recurring overloads in the City's downtown area and the cannery district in the east.

In 1958, a bond issue financed the relief sewers, along with additional primary and secondary treatment units at the MWQCP and a 200-acre oxidation pond west of the San Joaquin River to augment secondary treatment systems during the canning season.

By 1964, construction on the deferred North Plant was completed. At the same time, the City abandoned the Smith's Canal Plant and began sending wastes formerly treated there to the MWQCP. Still, biological loadings of receiving waters remained a problem. Rates of flow into the overburdened MWQCP made it clear that further construction was necessary.

The Regional Water Pollution Control Board in February, 1963, issued a cease and desist order directing the City of Stockton to comply with effluent disinfection requirements and to develop a schedule for compliance with the Board's dissolved oxygen requirements for the San Joaquin River. Construction completed in 1964 met the City's needs for the near future and fulfilled State requirements.

Still realizing that long-range planning was necessary, however, the City of Stockton contracted with a consulting engineer to prepare an engineering study and master plan, entitled, "1964-65 Stockton Sewage Survey." Among its recommendations

was the ultimate construction of four sewage treatment plants to serve the entire community of Stockton. The plan was adopted by both the Stockton City Council and the County Board of Supervisors. For the most part, the City has followed the master plan.

In 1971, however, the need to re-evaluate the 1964-65 plan became evident. During the past 5 years, new requirements in water quality and area planning have been adopted. Work is now underway to expand the existing City's Main Water Quality Control Plant to provide tertiary treatment for the southern portion of the City which is receiving State Clean Water and EPA Grants. The grant contract conditions require the City to accept the responsibility as the regional sewage treatment authority.

The Interim Water Quality Control Plan, published by the State in June 1971, calls for re-evaluation of Stockton's four-plant plan. Stockton's two North service area plants, the City's North and the County's Lincoln Village Plants, currently provide sewage service for most of the area north of the Calaveras River.

The Central Valley Regional Water Quality Control Board staff has proposed revised discharge requirements for the North and Lincoln Village Plants. The revision, in effect, demands these plants also provide tertiary treatment to meet new discharge requirements.

B. PURPOSE AND SCOPE OF PROJECT STUDY

This study was conducted by CH2M HILL to determine the most cost-effective means of providing sewage service to the North Stockton area in accordance with water quality and overall environmental

objectives, at the direction of the City of Stockton, which is the regional sewage treatment authority. The project study report will conform to the project report guidelines which are required of agencies seeking Clean Water Grants. The study area must cut through agency boundaries and consider the entire North Stockton area.

The population which must be served in the project area will total 154,000 in the year 1995 which includes 109,000 north of the Calaveras River. The economic analysis will consider the capital costs necessary for flows expected in 20 years plus operation and maintenance costs for an additional 30 years. The environmental and social cost will be based on a thorough environmental assessment and public opinion of the viable alternatives.

C. PLANNING OBJECTIVES AND GOALS

In order to provide the service to meet the needs of natural growth, the City of Stockton is charged with the responsibility of providing sewage treatment facilities for the North Stockton service area. The City's objective is to provide the best practical treatment system consistent with discharge requirements for the San Joaquin Delta and for growth anticipated in the current master plan. Within this framework, the sewerage plan is designed to serve the best interests of the public and have the least net impact on the social and physical environment and water quality.

As designed, the plan meets the anticipated flows and plant loadings that would be generated by the population growth and development foreseen in the master plans and zoning ordinances of the City and County. As the public body responsible for

controlling and directing growth, the City has the obligation to provide municipal facilities for that growth. To meet this obligation, the City is proposing the construction of a North-South Interceptor, which has been determined to be the most cost-effective means of meeting their objectives.

D. ORGANIZATION OF PROJECT STUDY TEAM

The task of compiling a long-range, comprehensive Facility Plan consistent with the desires of a majority of the citizenry and their public agencies, was assisted by a project review team. The project review team consisted of representatives from the Central Valley Regional Water Quality Control Board, Environmental Protection Agency, City of Stockton and their engineering consultant, CH2M HILL and the project team leader, Mr. Les Delbon, representing the Clean Water Grant division of the State Water Quality Control Board. Other agencies, such as the City and County planning agencies, Department of Fish and Game, local health department, Air Resources Board staff, and Department of Public Health contributed to the planning and recommendations of this Facility Plan.

On 28 September 1973, the first meeting of the State project team was called by the team manager. In attendance were representatives from the Environmental Protection Agency, the State Board, the Regional Board, the City of Stockton, and the City's consulting engineers, CH2M HILL.

On 12 October 1973, a second meeting was held in the office of the Public Works Director of San Joaquin County. There to discuss the scope of the Facility Plan, in addition to those in attendance at the September meeting, were representatives of the County Public Works Department and County health department.

At the October meeting, proposed discharge requirements associated with the possible expansions of one or both existing North Stockton Plants were discussed with the Central Valley Board staff. It was concluded that the Facility Plan should include the entire North Stockton area, rather than limiting it to agency boundaries.

During the phase of the study concerned with assessment of the environmental impact of a sewerage project on the area, representatives from the State Department of Fish and Game, the State Department of Public Health, the Air Resources Board, and City and County planning agencies were contacted.

II. SUMMARY AND RECOMMENDATIONS

A. EXISTING AND PROJECTED SERVICE AREA CHARACTERISTICS

The Stockton area is situated on the San Joaquin River 50 miles south of Sacramento. The sewerage service area of the proposed project covers the north half of Metropolitan Stockton and areas within San Joaquin County generally north of the Calaveras River.

Although the Sierra Nevada foothills lie 15 miles to the east, the land in the project area is relatively flat, seismically inactive, and features soils of low to moderate permeability. The climate is semi-arid, typical of the rest of the interior basin.

Groundwater in San Joaquin County is generally adequate, but a cone of depression and an accompanying degradation of groundwater quality is centered under the City of Stockton.

Land use in the proposed 21,500-acre project area is currently devoted primarily to agriculture and secondarily to residential development, with patches of commercial, institutional, and recreational uses. In the future, residential uses are expected to increase. Economic growth and employment patterns are expected to follow current trends, with the exclusion of heavy manufacturing.

An estimated 100,300 people reside within the bounds of the proposed service area. Between 75% and 85% of Stockton's growth is expected to take place in the project area, yielding a 1995 figure of 154,000. Growth is anticipated to continue, with or without a sewerage project.

Air quality in the proposed project area is generally acceptable, although the region is located under a large thermal inversion layer. As a result, the area will be prone to increased levels of photochemical smog and related pollutants associated with the urban growth that an expanded wastewater system would permit.

Situated within the Sacramento-San Joaquin Delta region, Stockton and the proposed project area play a significant ecological role in the future of the Delta's unique fish, wildlife, and open space resources.

B. EXISTING AND PROJECTED WATER AND WASTEWATER CHARACTERISTICS

At the present time, the City of Stockton and the California Water Service Company own and operate the majority of municipal and industrial supply facilities. Water pumped by these agencies is from groundwater supplies. In future years, additional sources of municipal, industrial, and agricultural water will be needed. High quality Calaveras River water obtained through the new Hogan Dam project should be available to the North Stockton area by 1976.

Sewage in the North Stockton area originates almost entirely from domestic sources. The average dry weather flow from the area is 100 gallons per capita per day.

Except in the Smith's Canal area, storm inflow appears to have no effect on the design capacity of the project. In the Smith's Canal area, however, current consolidation of many storm catch basins with City sanitary sewers places regular overloads on the system.

An inflow reduction plan for eliminating catch basins from the sanitary sewer system would cut storm inflow by 90%.

C. ANALYSIS OF EXISTING WASTEWATER FACILITIES

There is currently sufficient capacity at the City's MWQCP to accommodate flows from the North Stockton area. As currently designed, two treatment plants in the north area treat sewage and discharge into Fourteen-Mile Slough. Plant operation and management practices at City and County plants are acceptable or superior under present discharge requirements, but new requirements will require substantial plant improvements at the north sites.

In the future, consolidation of sewer service to the entire North Stockton area will require further expansion at the MWQCP.

D. WASTE DISCHARGE AND TREATMENT REQUIREMENTS

Waste discharge and treatment requirements for the North Stockton area have been prepared by the staff of the State and Central Valley Water Quality Control Boards.

Current potential for reclaiming of wastewaters for reuse by agriculture or power plant cooling appears slim. There may be viable industrial uses for reclaimed wastewater.

All treatment plants in the Stockton area will be required to install advanced waste treatment facilities by 1 December 1976.

E. PROJECT ALTERNATIVE ANALYSIS

A total of nine alternatives exist for sewage treatment projects servicing the North Stockton area. Of these, three are determined to be feasible:

Alternative I:

Upgrading and expanding the existing Lincoln Village and North Treatment Plants.

Alternative II:

Upgrading and expanding the North Plant into a regional treatment plant for the North Stockton area.

Alternative III:

Consolidation of sewage treatment for the North Stockton area at the MWQCP through construction of a North-South Interceptor.

A summary of costs indicates capital investments for each of the alternatives are about the same, ranging from $8.8 to $10.2 million. However, operation and maintenance costs make Alternative III far superior in regards to cost effectiveness.

While Alternatives I and II promise odor problems due to their proximity to urban areas and continued degradation of receiving waters, Alternative III offers the least detrimental impact on the environment.

All three alternatives are growth inducing, but Alternative III would be more likely to facilitate growth patterns as they are currently designed by local agency planners. Thus, Alternative III would also have the least social impact of the three.

F. SUMMARY COMPARISON OF PROJECT ALTERNATIVES

From a thorough list of project alternatives, early analysis pointed to three viable alternatives. These three alternatives were then subjected to closer analysis in order to find the single alternative that would impose the least environmental impact, provide the best overall economic solution, minimize social constraints, and require the fewest tradeoffs between benefits and costs of project implementation.

A detailed analysis of comparative objective and subjective variables was conducted. The analysis proves Alternative III, the North-South Interceptor, to be the most efficient and desirable alternative.

The present worth value of the capital costs for each alternative are nearly the same, but Alternative III would call for approximately one-half the operation and maintenance expenses of Alternatives I and II. Effluent discharge into receiving waters would be far less under Alternative III. Alternative III offers the most efficient use of resources and the greatest flexibility and reliability.

Alternative I requires no interagency agreements for implementation. All three alternatives are compatible with local planning goals, however, Alternatives I and II would continue operation of odorous treatment plants upwind from residential developments.

G. APPARENT BEST ALTERNATIVE PROJECT

Alternative III, the North-South Interceptor, is proposed as the most cost-effective and desirable alternative to fulfill sewage treatment needs for 154,000 people in the North Stockton

service area. The MWQCP has sufficient capacity for the added existing flows, however, the consolidation of the new area will require the proposed MWQCP expansion to be larger and schedule earlier. A view of current and potential discharge restraints by regulatory agencies reveals that Alternative III, consolidation of treatment at the MWQCP, provides the most adaptability.

As proposed, the project would include a North-South Interceptor to collect sewage now being treated at the Lincoln Village and North Treatment Plants and convey it to the Main Water Quality Control Plant. The interceptor will be comprised of force mains, gravity pipelines, a new 29-mgd pump station at the Smith's Canal site, and a cost-effective inflow-infiltration reduction system to remove storm flow from the sanitary sewer system.

The estimated project cost is $6 million, with 87-1/2% of the cost proposed to be financed from State and Federal funds and the remainder to be financed by the City of Stockton. The project completion date is set for 1976.

Operation and maintenance of the system will be merged with the City's current program. All users within the service area will be charged equitably, regardless of their proximity to the treatment plant.

H. RECOMMENDATIONS

Based upon a thorough analysis, including economic, environmental, and social considerations, consolidation of treatment via the North-South Interceptor is proposed as the most cost-effective solution for providing sewage service. The North-South Interceptor

would intercept the sewage north of the Calaveras River and convey it to the existing MWQCP for treatment. The project provides for the eventual abandonment of the Lincoln Village Treatment Plant and the City's North Sewage Treatment Plant. The proposed project would provide sewage service to a population of approximately 101,000 north of the Calaveras River and 53,000 south of the Calaveras River in the Smith's Canal and Pacific Gardens areas.

The North-South Interceptor meets the goals of the regional sewage authority in providing sewage service for the North Stockton area within the identified constraints of environmental, social, and water quality objectives. Construction of the North-South Interceptor would begin in the spring of 1975, preceded by preparation of plans and specifications beginning in the early spring of 1974. Project completion is anticipated in 1976. The implementation, which includes the consolidation of the City plant and County's Lincoln Village Plant could begin immediately following construction completion. The project provides the best overall cost-effective solution to sewage collection, treatment, and disposal in the North Stockton area.

III. EXISTING AND PROJECTED SERVICE AREA CHARACTERISTICS

A. SERVICE AREA BOUNDARIES AND COMPOSITION

Metropolitan Stockton lies in the east-central part of the Great Interior Valley of California which occupies the central part of the State. Sacramento is 50 miles to the north, and Oakland and San Francisco are about 80 miles to the west.

More immediate to the area are the cities of Lodi to the north and Tracy and Manteca to the south. The Calaveras River bisects the area as it travels from east to west to meet the San Joaquin River on the west side of the City of Stockton.

The City of Stockton has access to a deep water channel, one of only two such channels serving the Central Valley. Map III-1 shows this proximity as well as the physical relationship of Stockton and the North Stockton Wastewater Facility Plan service area to Rough and Ready Island owned by the U. S. Navy, Port of Stockton, County and State hospitals, Mokelumne Aqueduct, and the University of the Pacific, to name a few.

B. GEOGRAPHICAL SETTING

The service area of the proposed project is located in the north half of Metropolitan Stockton and encompasses land within the City of Stockton's boundaries and County of San Joaquin area outside of City boundaries.

The more important geographical features which are near the North Stockton service area are the San Joaquin River, the Calaveras River, Smith's Canal, and the Stockton Deep Water

Channel. Directly west of the service area are miles of delta waterways and numerous islands. Approximately 15 miles east lies the edge of the Sierra Nevada foothills.

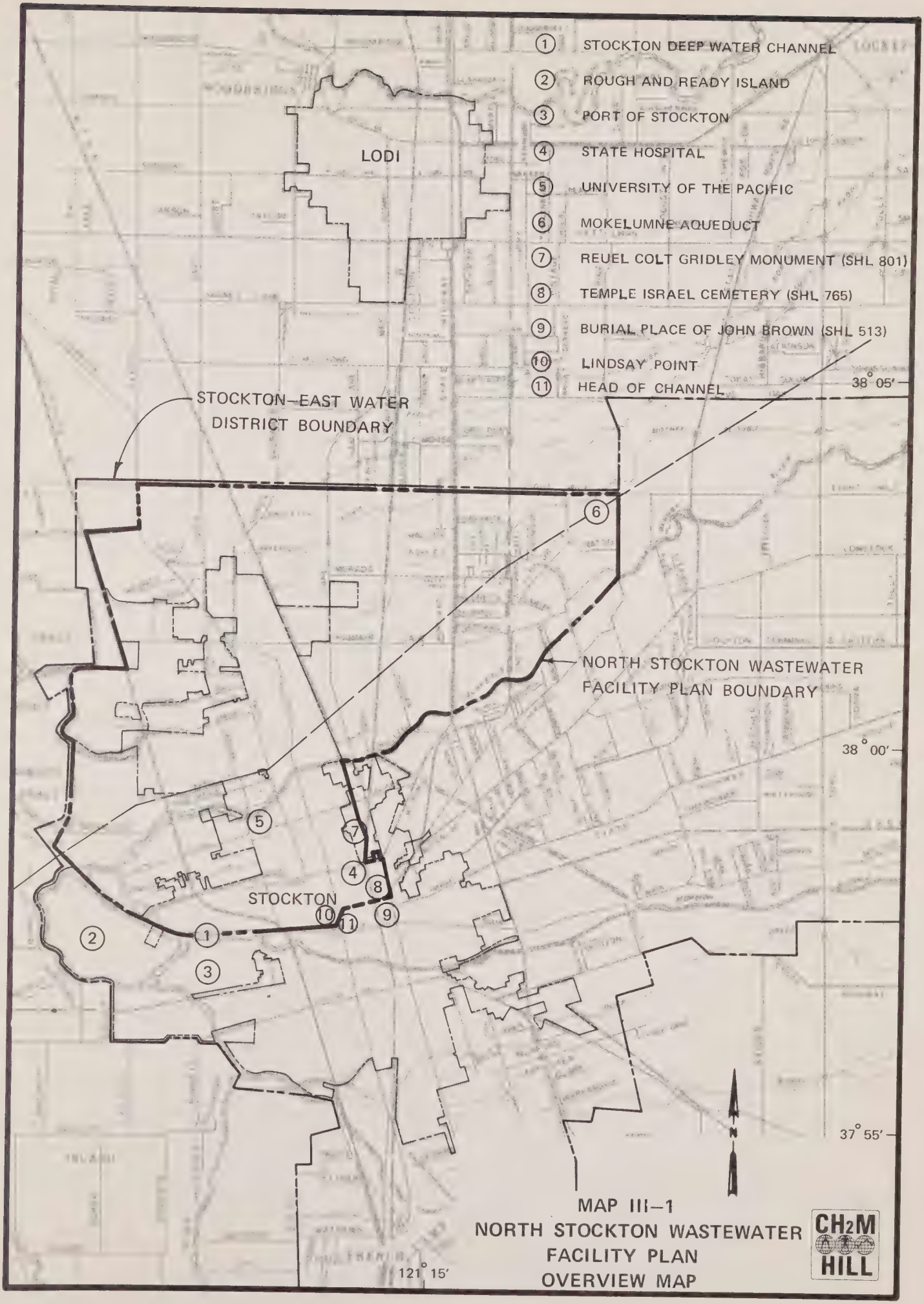
Topography

The topography of the North Stockton service area and the Stockton area is relatively flat. The slope of the land is about one foot per 1,000 feet in the east to west direction and has practically no north-south slope. Elevations within the service area range from sea level on the west side to about 70 feet above sea level on the east side.

Geology

As far as can be determined, the area's geology is not pertinent to the proposed project. According to Bulletin No. 146 of the California Department of Water Resources entitled, "San Joaquin County Groundwater Investigations," published in July of 1967, "The County is considered seismically quiet with only one reported earthquake epicenter of magnitude greater than 4.0 on the Richter scale between 1934 and 1967. This suggests that faulting that might extend upward into the near-surface sediments in the groundwater basin is minor."

The surface geology of the service area consists of two formations. The Recent Alluvium and Victor formation in the east, characterized as moderately permeable, discontinuous gravel, sand and clay; and the Flood Basin Deposits in the west, described as low permeability clay, silt, sand, and gravel.



MAP III–1
NORTH STOCKTON WASTEWATER FACILITY PLAN
OVERVIEW MAP

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Soils

Surface soils in the Stockton area, in general, are interfan and basin soils which lie between the Mokelumne, Calaveras, and Stanislaus fans. The soils generally have well-developed profiles, medium to heavy texture, and underlying fairly well compacted subsoils. These soils have low infiltration rates based on their soil texture.

The surface soils in the North Stockton service area are predominantly clay or a clay combination. Sacramento adobe clay occupies extensive areas north and east of Stockton and covers the northern part of the North Stockton service area. In the southern half of the North Stockton service area is found Honcut clay, Sacramento organic silty clay, Sacramento silty clay, and Columbia silty clay loam. All of the soils typically occupy nearly flat basins, often adjacent to major streams. Surface drainage ranges from fair to poor and all exhibit negligible erosion.

Climate

The North Stockton service area, like the Great Interior Valley, has a distinctly semiarid climate. The winters are mild and moist, the summers hot and dry. Essentially, a two-season cycle prevails, spring and fall representing mild transition periods between the two dominant seasons of winter and summer.

As can be seen from the data in Table III-1 (Appendix A), the mean annual temperature ranges from 41°F in January and December to 75°F in July and August. Maximum daily temperatures range as high as 100°F to 110°F with minimums in the 30°F range. While extreme lows can be 20°F, freezing rarely occurs. The area has

a frost-free growing season of about 230 days with 295 days between killing frosts.

The long-term average annual rainfall is 14.31 inches with the majority occurring in December through March. The driest year in Stockton was 1929 when only 5.92 inches of rain were recorded. The wettest, 1906, had 26.43 inches. Snow rarely falls in the Stockton area.

The prevailing winds are from the northwest and are responsible for the cool summer evenings and nights. Low summer humidity makes the daytime temperature bearable. In the spring, the winds reach high velocities, but are rarely destructive. During the rainy months of December and January, they blow from the south.

Groundwater Basin

The North Stockton service area is located within the San Joaquin Valley groundwater basin and has no natural limits. Historically, the Stockton area has had more than sufficient amounts of fine quality groundwater.

However, there presently exists a severe cone-of-depression roughly centered in the middle of the City of Stockton. This cone is a result of supplying the municipal and industrial needs of the City from wells. Poor quality groundwater is entering the area from the west due to the slope of the groundwater table caused by the cone-of-depression. According to the Department of Water Resources' Bulletin No. 146, "There are no lithologic, structural, or apparent consistent hydraulic discontinuities which would stop the incursion of water in an easterly direction from the Delta."

The overdraft on the groundwater has created a subsidence problem which is believed to be a direct result of lowering groundwater levels. In the Stockton and French Camp areas, this subsidence is occurring at a rate of one-tenth of a foot per year. In a report prepared by Stoddard & Associates of Los Banos, California, entitled, "Master Water Plan for Stockton - East Water District," the conclusion was drawn that surface-supplied water is necessary immediately to allow the groundwater to stabilize at a level which would keep out intruding waters from the Delta.

C. LAND USE

Existing

The City of Stockton's planning department prepared a report entitled, "Land Use Data, Report No. 2, Zoning," dated June 1970, which lists land usage by census tract. This report details the various land use categories as of 1 September 1969, and is the most recent information available on this subject.

The study area used for the above report does not include all of the service area of the proposed project. In fact, of the approximate 21,500 acres in the service area, only 12,500 acres were considered in the report. Table III-2 shows the land uses as found in the City's report.

TABLE III-2

EXISTING

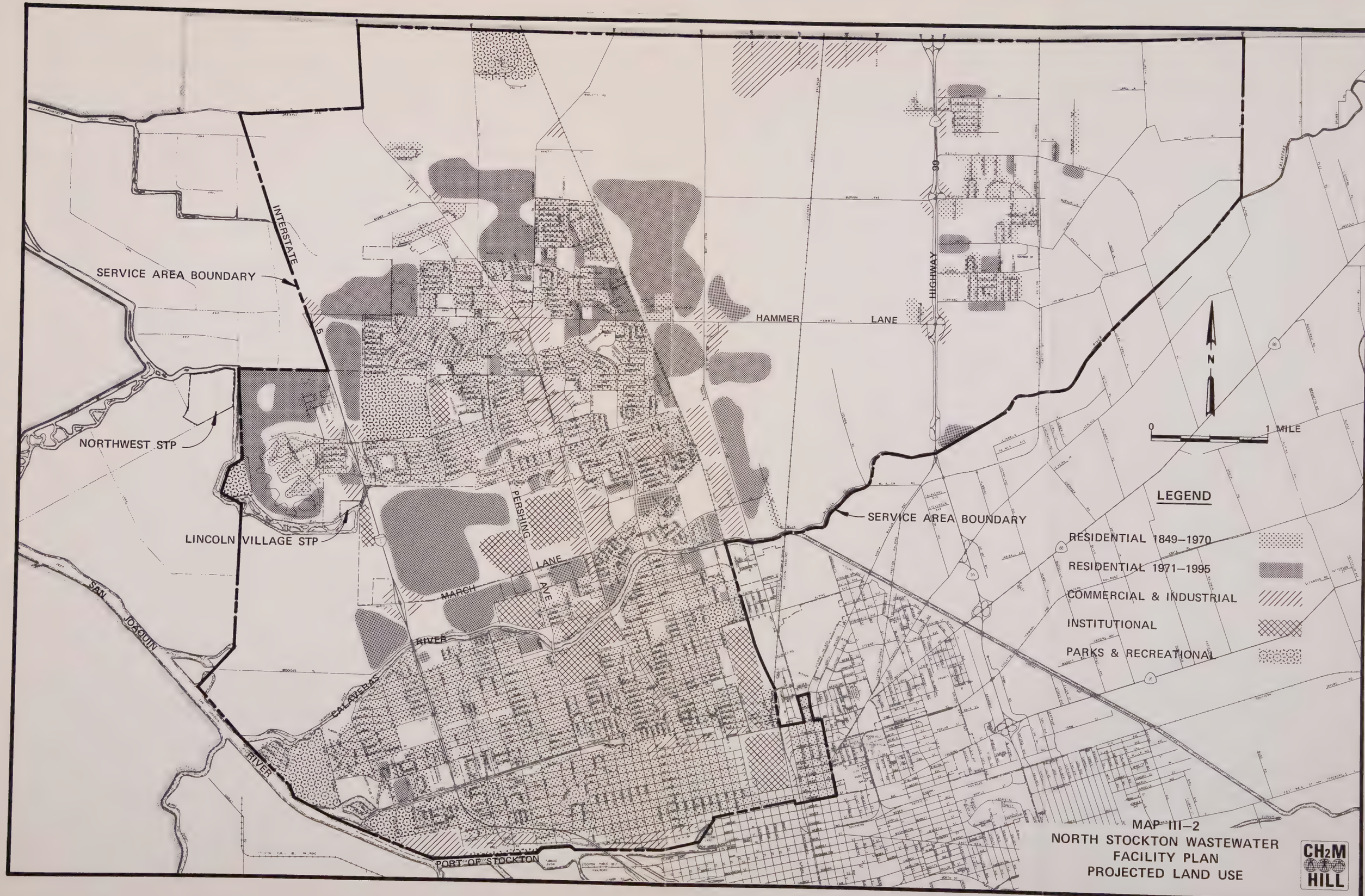
LAND UTILIZATION IN ACRES

	Residential	Comm.-Lt. Ind.	Inst.	Parks & Recr.	Ag.	Vacant
North of River	2,015	428	295	307	4,574	1,247
South of River	2,193	264	504	304	100	296
TOTAL	4,208	692	799	611	4,674	1,543

After conferring with City planning personnel, it was estimated that of the 9,000 acres not accounted for in the Land Use Data Report, 95% of this area is used for agricultural purposes while the remaining 5% is either used for residential land or is vacant. These figures compare favorably with information presented in the report by Stoddard & Associates previously cited. That report shows a total of 14,760 acres in irrigable lands, fallow or pasture lands.

Projected

The projected land use within the service area of the proposed project for the design period is shown on Map III-2. Table III-3 shows the land use projections for the service area.



MAP III–2
NORTH STOCKTON WASTEWATER
FACILITY PLAN
PROJECTED LAND USE

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TABLE III-3

PROJECTED

LAND UTILIZATION IN ACRES

	Residential	Comm.-Lt. Ind.	Inst.	Parks & Recr.	Unclassified
North of River	5,618	694	367	360	-
South of River	3,223	264	301	275	-
TOTAL	8,841	958	668	635	10,400

As can be seen, the available land for agricultural purposes, which is shown as unclassified, has decreased. For the year 2000, the Stoddard Report projected 10,340 acres used for agriculture compared to the 10,400 available acres shown above. For the year 2020, they projected approximately 5,000 acres of land to be used for agricultural purposes in the North Stockton area.

The City of Stockton is presently reviewing and revising their projections of land use within their sphere of influence, but this information is not yet available. However, Map III-2 has been reviewed by the City's planning department and represents a reasonable prediction of future land utilization in the North Stockton service area.

D. ECONOMIC ACTIVITY

The various commercial and industrial concerns, educational facilities, and governmental agencies that presently occupy sites and provide employment in the North Stockton service area are generally similar to those that will be constructed in the

future. Existing facilities will grow and new ones will be introduced.

The planning departments of the City of Stockton and San Joaquin County have prepared a report entitled, "Transportation Study - Employment Projections," dated May 1971. The report lists seven occupational divisions which have been subdivided into appropriate categories. Each category lists by census tract and traffic zone the number of persons employed and type of employment for 1967, along with an employment projection to the year 1995.

That part of the North Stockton service area which is north of the Calaveras River is projected by the Transportation Study report to show increases in all of the divisions except the manufacturing division. Of all the new jobs projected for this area, approximately 48% will be in the retail division and about 30% in the educational service and government division.

The Transporation Study report indicates the increases for the remainder of the North Stockton service area south of the River. Three divisions: retail, services, educational services, and government account for 60% of the new jobs. Each will contribute about 20%.

The Transportation Study report cited above follows the planning and zoning policies as do all City and County reports. It assumes the service area of the proposed project will be basically residential with commercial, educational, and light-industrial services that contribute to and are compatible with this type of land use.

E. POPULATION AND POPULATION CHARACTERISTICS

Past Population

In 1967, a special census for the Stockton metropolitan area was prepared by the United States Bureau of Census under contract with the City of Stockton and San Joaquin County. This special census serves as the basis for the population and population characteristics for the North Stockton Wastewater Facility Plan.

General Plan Report No. 3, prepared by the City of Stockton using the information gathered by the 1967 special census, indicates a 1967 population of 156,750 people for the 62 subareas contained in the study. In 1970, the City of Stockton and San Joaquin County jointly prepared a report entitled, "Transportation Study - Housing and Population Projections." This report was also used to plot the population curves shown on Figures III-1 and III-2. The subareas included within the North Stockton Wastewater Facility Plan service area boundary show a 1967 population of 85,100 people. This figure is consistent with both reports.

Present Population

The most accurate source of available information from which the present population of the service area can be determined is a report supplied by the City of Stockton entitled, "Housing Unit Study, 1969-1972." This report lists single-family units, duplex units, triplex units, and multi-family units by census tract and traffic zone. Applying population per unit figures that the City of Stockton used for the report, "Transportation Study - Housing and Population Projections," the 1972 population of the service area was found to be 100,300 people.

Future Population

The Stockton area has historically been one of the fastest growing areas in San Joaquin County. Attracting this growth are major highway and railroad facilities, a deep water channel for large ships, a climate conducive to recreation and agriculture, and progressive and responsible governmental agencies, to name a few. There is no reason to expect the area will not continue to grow at a rate equal to or greater than the County as a whole.

Metropolitan Stockton has a projected growth rate essentially the same as the San Joaquin County projection, which is based on figures set forth in the Series D fertility table presented as Appendix B in the State Water Resources Control Board's, "Project Report Guidelines for Agencies Seeking Clean Water Grants," dated September 1973.

The growth rate in the North Stockton service area is slightly greater than either Metropolitan Stockton or San Joaquin County. Older, more well developed areas in Metropolitan Stockton are growing at a slightly lesser rate than the County. The current planning and zoning for the City anticipate 75% to 85% of Stockton's growth to occur in the North Stockton area. Studies indicate the projected growth rate for the service area will yield an area population of 127,000 by 1985 and 154,000 by 1995.

Two of the eight subareas within the North Stockton service area, the North Pump Station area and the State hospital area, are expected to grow much faster than the rest of the area. Conversations with City engineers and planning staff indicate Stockton planning and zoning already anticipate this localized growth. The North Stockton Pump Station area is expected to more than

double its present population of 36,000 by 1995. The State hospital area is expected to grow from 1,500 to 9,500 by 1995. Of the remaining six subareas, the densities of four are already near 1995 capacity and the other two, the Lilval West area and the Lilval East area, should be near 1995 capacity in 5 to 10 years. Commercial and residential buildings are currently being erected in the Lilval West area. Construction is also underway in the Lilval East area.

A listing of service area population by census tract and traffic zones is included in Appendix A.

The present and future location of industry in the service area is and will be minimal. No industrial wasteloads or population equivalents are used or anticipated for this project.

Figure III-1 shows projected population curves for San Joaquin County, Metropolitan Stockton, the North Stockton service area and the service area north of the Calaveras River. Population projections are consistent with those anticipated for the City and County by the State Department of Finance.

Figure III-2 shows projected population curves to the year 1995 in specific subareas of the North Stockton service area. Subareas are determined by the sewage treatment plant or sewage pump station to which wastes are currently being conveyed. Data are drawn from the "Transportation Study" report and the "Housing Unit Study" report prepared for San Joaquin County on information provided by the State Department of Finance. County estimates were related to the Stockton study area. That area was divided into census tracts and the census tracts were further divided into traffic zones.

F. REGIONAL AIR QUALITY

The Stockton area is located within a large thermal inversion layer, as is all of the San Joaquin-Sacramento Valley. This results in "smoggy" conditions during certain times of the year, primarily due to automobile emissions and industry. Smog levels tend to worsen during the summer and improve with the onset of winter rains. Agricultural burning aggravates the air pollution problem, especially during times of minimal air currents. Westerly sea breezes from San Francisco Bay relieve the situation to a degree.

During 1972, oxidant levels greater than .08 ppm were recorded for a total of 49 hours over a period of 20 days. Carbon monoxide levels greater than 9 ppm were recorded for a total of 25 hours over a period of 4 days. Out of 56 particulate matter samples, a total of 22 were equal to or greater than 100 mg/M^3. Nitrogen dioxide levels were below the .25 ppm State limits.

Due to the air inversion pattern on particular days, smog levels will increase. It must be noted, however, that during 1972 the air movement was considered "calm" only 9.8% of the time. The winds on the average plot from northwest to southeast. This is important in that it allows odors from the Lincoln Village and North Plants to blow directly toward existing urbanized areas. The same wind pattern allows the odors from the MWQCP to blow away from most urbanized locations.

By providing sewerage facilities adquate to meet population growth projections for the next 20 years, the proposed project would have as its prime impact on air quality, a potentially dramatic increase in localized automobile traffic and related emissions.

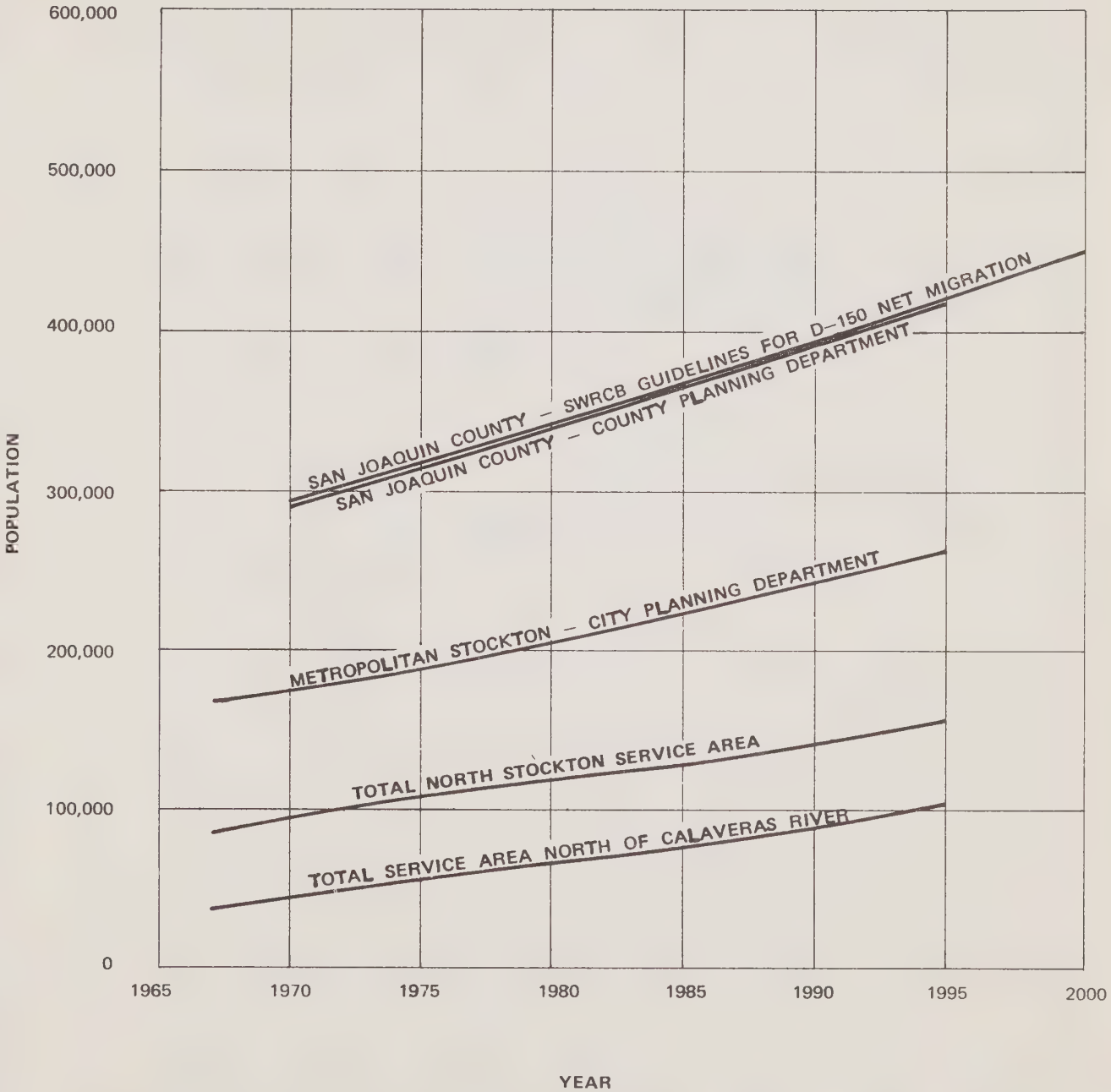


FIGURE III–1

POPULATION PROJECTIONS

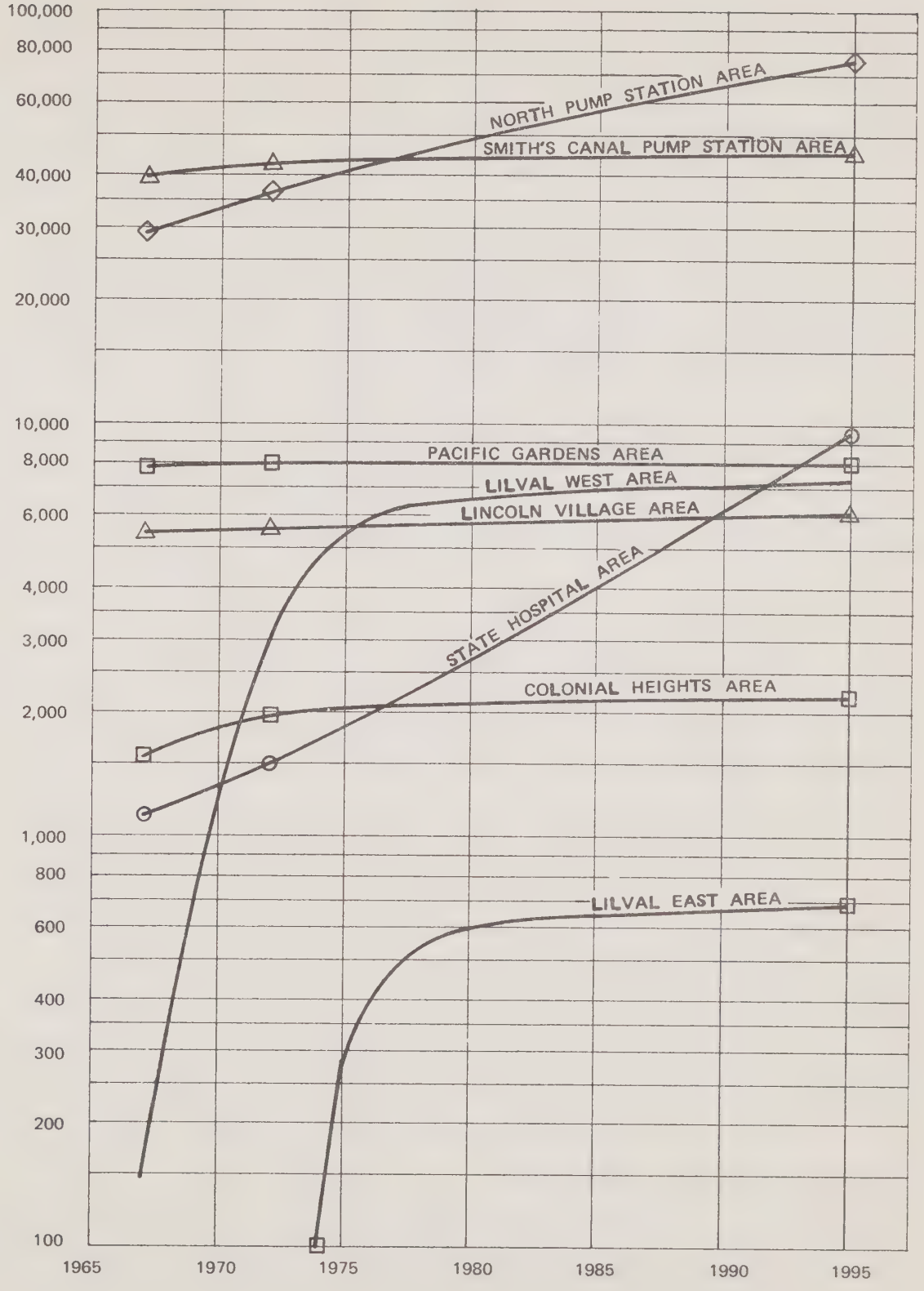


FIGURE III–2

POPULATION PROJECTIONS
FOR SERVICE AREA

CH2M HILL

Estimated population increases indicate that growth will continue at a fairly constant pace, especially in the State hospital and North Pump Station areas. Statistics indicate by 1975 there will be a 6% population increase over 1972. By 1985 this margin will have increased by 21%, and in 1995 there will be a 35% increase over 1972; an average of 15% every 10 years.

Using motor vehicle emission composite emission factors obtained from the California State Air Resources Board, statistics point to a decrease in organic and carbon monoxide (CO) levels over a 30-year period, whereas, there will be an increase in the nitrogen oxide (NO_x) levels. The exact figures are shown in Table III-4. However, due to the energy crisis and the possibility of the banning of emission control devices, the figures may be higher than projected.

Another long-term effect of the proposed project would be the minor odor problems that would prevail at the MWQCP even with the new enlargements and improvements. The abandonment of the North and Lincoln Village Plants would eliminate odors in the north region, however, odors at MWQCP could be minimized with special improvements to grit removal facilities.

The immediate impact of project construction on air quality would be limited to customary excavation dust, which would be kept to a minimum with surface watering, and temporary localized auto emission increases associated with traffic congestion around construction sites. Efforts to control the latter problem would include standard traffic control procedures.

Detailed discussion of the regional air quality is presented in the Environmental Assessment of the North Stockton Wastewater Facility Plan, a separate document prepared concurrently with this report.

Table III-4

NORTH STOCKTON PROJECTED EMISSION FACTORS

	1972 Population (100,333)			1975 Population (107,105)		
Emission	Organics	CO	NOx	Organics	CO	NOx
Emission Factor	10.953	106.645	6.998	8.06	75.6	6.84
*Total	549,468	5,349,953	351,061	431,629	4,048,531	366,295

	1985 Population (127,680)			1995 Population (154,114)*		
Emission	Organics	CO	NOx	Organics	CO	NOx
Emission Factor	3.55	43.5	5.3	3.55	43.5	5.3
*Total	226,632	2,777,040	338,352	273,552	3,351,979	408,402

*Based on two persons per vehicle.

G. ENVIRONMENTAL SETTING

The Stockton area is situated along the San Joaquin River in the Central Valley of California. Stockton is the county seat of San Joaquin County and its largest city. Sewerage areas include the City and adjacent urbanized unincorporated territory.

Within the City of Stockton can be found commercial, residential, industrial, institutional, and recreational development. Principal industries have historically related to food processing, but have diversified in recent years. An important social and economic feature is the University of the Pacific, situated adjacent to the Calaveras River. Much of the land in San Joaquin County and portions of the undeveloped land in Stockton's North service area is devoted to agriculture.

The proposed project lies within the Sacramento-San Joaquin Delta region, an area roughly triangular in shape and covering 1,100 square miles. All water from the Central Valley (except that in the Tulare Lake Basin) drains through the Delta to San Francisco Bay and into the Pacific Ocean.

About 700 miles of meandering channels in the Delta flow around more than 50 reclaimed islands with a total land area of 700 square miles. The Delta is mainly agricultural, but its waterways are used extensively for fishing, boating, and water skiing.

The Delta represents one of California's major fishery resources. An estimated 4 to 8 million adult striped bass are dependent on the area during much of the year. About 60% of these fish spawn in the Delta channels each spring, while the remainder spawn in the Sacramento River upstream from Hood. Juvenile striped bass depend on Delta waters during maturation.

Other Delta spawning runs include up to 500,000 king salmon, 100,000 steelhead and 2 million American shad. Also found in large numbers are sturgeon, catfish, black bass, and crappie. Found in abundance are aquatic food species vital to maturing and adult fish. Included in this grouping are zooplankton and microscopic organisms consumed by fish larvae and fry; neomysis, a tiny shrimp eaten by small fish; and benthose, those bottom animals such as clams, worms, and insects eaten by catfish and sturgeon.

Delta fish populations presently support more than 3 million angler-days of sportfishing annually. The annual catch of ocean salmon spawned in the Sacramento and San Joaquin River systems averages 8 million pounds, for a net income to the fishermen of more than $3 million.

A large population of ducks, shore birds, and wading birds are found in the Delta region. Puddle-diving ducks and shore birds feed on small bottom creatures during their winter residency. Other food sources are emergent plants such as alkali bulrush, brass buttons, and fat hen. Other Delta birds include gulls, terns, pelicans, and cormorants.

Hunting in and around the area has decreased in recent years, probably due to increased human activity, fill, and public access problems.

Detailed discussion of the environmental setting is presented in the environmental assessment of the North Stockton Facility Plan, a separate document prepared concurrently with this report.

H. INSTITUTIONS WITHIN PROJECT PLANNING AREA

Municipalities

The City of Stockton, a State-chartered City, and the County of San Joaquin are the predominant public agencies serving municipal functions within or adjacent to the North Stockton service area. Also within the study area are several fire districts and a number of dependent and independent governmental agencies. The Stockton East Water District is the water authority encompassing the North Stockton service area.

Economic stability in the service area is provided from the industrial and commercial facilities in the Metropolitan Stockton area. This economic base is primarily outside the study area. North Stockton is composed, for the most part, of residential and supportive commercial developments.

Water Agencies

The City of Stockton, San Joaquin County, and the Cal Water Company currently supply water in the project area.

A comprehensive plan for water system development in the area has been prepared by the City of Stockton and the Stockton East Water District. The plan provides water service for domestic and industrial growth to the year 2020. Envisioned is the conjunctive use of a safe amount of groundwater and treated surface waters.

As shown on Map III-1, the Stockton East Water District encompasses not only the North Stockton study area, but also the entire Metropolitan Stockton region and some rural areas.

Wastewater Agencies

The two wastewater agencies in the area are the City of Stockton and San Joaquin County.

The County currently provides sewage treatment for the Pacific Gardens area south of the Calaveras River, Lincoln Village, and the Colonial Heights area north of Five-Mile Creek. The three separate maintenance districts served by the County are the Pacific Gardens Sanitary District, Lincoln Village Maintenance District, and the Colonial Heights Maintenance District.

The City of Stockton provides sewage treatment for the remainder of the study area north of the Calaveras River within City boundaries, as well as the recently annexed Rosemary Manor and Swain Oaks Manor Maintenance Districts.

A 1964-65 sewerage survey adopted by City of Stockton and San Joaquin County governing boards calls for the City to become the regional agency responsible for treatment of wastewater generated in the Metropolitan Stockton area.

Planning Agencies

The City of Stockton and San Joaquin County Planning Agencies are the predominant planning authorities in the North Stockton area. Both have adopted the general plan and zoning pattern upon which population statistics for this study were based.

The regional planning agency providing overall planning and guidance is the San Joaquin County Council of Governments.

IV. EXISTING AND PROJECTED WATER AND WASTEWATER CHARACTERISTICS

A. WATER SUPPLY AND USES

Water service was first provided to the North Stockton area by the City of Stockton in 1954. At the present time, the City and the California Water Service Company, a privately owned utility, operate the majority of the municipal and industrial water supply facilities servicing the study area. Other water supply agencies include the San Joaquin Maintenance Districts servicing Lincoln Village, Colonial Heights, and portions of the area lying between Highway 99 and Central California Traction Railroad.

Historically, the North Stockton area has obtained its municipal and industrial water from groundwater. This pumping, combined with drawdown from wells south of the Calaveras River, has resulted in depression of the groundwater table beneath the Stockton Metropolitan area.

The City's current water system in the North Stockton area includes 13 wells with a total pumping capacity of about 10,000 gallons per minute. A 100,000-gallon elevated steel tank, located near Swenson Park, is the only storage facility owned by the City.

Twelve wells with a total capacity of 14,000 gallons per minute, service the California Water Service Company, Lincoln Village, and Colonial Heights water systems. Although Cal Water and Colonial Heights water system have no storage facilities, a 200,000-gallon elevated tank is owned by the Lincoln Village system.

In May 1973, the City of Stockton and the Stockton East Water District published a comprehensive plan for water system development in the North Stockton service area. Among its recommendations is a study to locate additional water supply sources in the future. Development of imported surface waters will be required to meet future demands from municipal, industrial and agricultural areas. Potential sources of additional water include the Calaveras River, the Folsom South Canal, the proposed Peripheral Canal, the San Joaquin Delta, and the Stanislaus River.

Groundwater, which the City has usually located at depths of 200 feet to 400 feet, is of generally good quality in the Stockton area. Concentrations of dissolved solids range from 250 to 300 parts per million. In the North Stockton area, the estimated safe groundwater yield is 7,700 acre-feet per year.

Water from the Calaveras River is of premium quality, with an average TDS concentration of approximately 100 parts per million. The Stockton East Water District and the Calaveras County Water District have contracted with the United States Bureau of Reclamation for water from the new Hogan Dam project on the upper Calaveras River. The project calls for diversion and intake facilities on the Calaveras River and a water treatment plant for the Stockton East Water District.

These facilities are currently in the design phase. It is anticipated the City of Stockton will begin in late 1975 or 1976 to purchase treated water from the Stockton East Water District for delivery to customers in the North Stockton area.

B. EXISTING WASTEWATER CHARACTERISTICS

Although there are commercial and institutional establishments in the area, all sewage flows from the North Stockton service area originate from domestic sources. Industrial flows never exceed 0.05 mgd. Sewage is essentially free of heavy metal and toxic compounds. The wet industrial flows that predominate at the Stockton MWQCP originate outside the service area tributary to the Facility Plan. For this reason, conventional treatment is adequate for sewage in the North Stockton area. Specially designed equipment, beyond that required for normal domestic sewage, is unnecessary. A monthly summary of the wastewater influent and effluent characteristics at each plant is included in Table IV-1 in Appendix B.

C. UNIT DESIGN LOADINGS OF EXISTING TREATMENT FACILITIES

The unit design loadings in the North Stockton service area are typical of those found in other residential communities. Although flow data at both existing plants is somewhat obscure, fairly accurate records have been kept of biological loadings.

Population figures and average flows specific to the Lilval West Pump Station and the Lincoln Village Treatment Plant can be easily isolated and studied. Since these areas contain the average range of commercial and institutional facilities, they may be used as a basis for determining average daily flows.

At the present time, the Lilval West service area provides pumping capacity for a population of 4,067 and has an average dry weather flow of 0.4 mgd, or an average daily per capita flow of 98 gallons (gpcd). The Lincoln Village Plant serves approximately 14,150 people and has an average dry weather flow of

1.4 mgd, or 101 gpcd. From these data, we conclude that the average dry weather flow, including residential, commercial, and institutional sources, is 100 gallons per capita per day.

On the basis of review of influent data from the monthly operational test, an average basis for design is a unit BOD loading of 0.20 pounds per capita per day.

D. INFILTRATION/INFLOW SUMMARY AND EVALUATION

Introduction

The Federal Water Pollution Control Act Amendments of 1972 require all applicants for treatment plant grants to demonstrate their sewer systems are not subject to excessive infiltration/inflow. Elimination of excessive infiltration/inflow by sewer system rehabilitation can reduce the cost of wastewater collection and treatment. To evaluate the economic benefits attainable by sewer system rehabilitation, a study must be conducted to identify the infiltration/inflow and determine if rehabilitation will be the most cost-effective solution.

To meet this requirement, the City of Stockton in November 1973 published an infiltration/inflow analysis for the Stockton Metropolitan area and submitted it to the State and the EPA with its grant application for tertiary additions to the MWQCP. The November report included analysis of the North Stockton area. It was concluded that special provisions need not be made for storm flow at the MWQCP, since industrial flows at the peak of the summer season far exceed any known storm flows. Therefore, it is determined, subsequent to capital improvements at the MWQCP, that cost-effective inflow repairs are not necessary to meet regulatory agency criteria.

This report will not repeat the work reviewed in the November report, which is available for reference. It shall, however, highlight portions of that report pertinent to the North Stockton area and supplement prior data where necessary.

Existing Flows

The North Stockton service area system does not contribute to the wet industrial flows which make up a substantial portion of the flows into the MWQCP. (See Map III-3.) During the peak of the food processing season some of the canning flows are currently diverted into the Smith's Canal area to provide relief to the normally used interceptors. This diversion will not be necessary with the construction of the South Stockton Interceptor, a project which is expected to follow this proposed project by approximately one year. Because there are no current industrial flows from the North Stockton area and because future industrial flows are not expected to exceed 50,000 gallons per day per user, industrial flows above the normal commercial and institutional levels have not been included in the design flow.

North Treatment Plant

The North Plant currently serves a population of approximately 22,000 people, which includes all of the service area north of the Calaveras River, excluding Lincoln Village and Colonial Heights. All sewage pumped into the North Plant comes through the Lilval West and North Pump Stations. The average dry weather flow is 1.8 mgd at the North Pump Station and 0.4 mgd at the Lilval West Pump Station, for a total flow of 2.2 mgd.

Flow records indicate the peak storm flow to be less than the peak dry weather instantaneous flow. No substantial or immediate

increases in the flow rate have been recorded at either pump station during or immediately following a storm, indicating there is no significant inflow. Minimal flow rates during the early hours of the morning are higher during wet seasons, indicating minimal infiltration of approximately 0.5 mgd. However, the peak wet weather flow is less than the peak dry weather flow. It is apparent, therefore, that infiltration has no effect on the design capacity of the project.

The peak dry weather flow is found to be consistent with the peaking factor developed for the project. The peak flow rate is not consistent with peaking curves developed at the MWQCP for the City of Stockton. The effect of the larger percentage of industrial and commercial flow at the MWQCP depresses the daily peak rates.

Lincoln Village Treatment Plant

The Lincoln Village Plant currently serves a population of about 14,000 located in Lincoln Village, Colonial Heights, and Pacific Gardens service areas shown on Map III-3. The average daily dry weather flow at the Lincoln Village Plant is estimated at 1.2 mgd to 1.4 mgd. The absence of flow data and restriction of the Pacific Gardens Lift Stations makes it difficult to properly analyze the peak flow at the Lincoln Village Plant. However, no cases of sewage overflow or backup have ever been reported. The peak storm flow rate is estimated at approximately 3 mgd. Based on the peaking curves, the maximum peak on a dry weather day is calculated at 2.7 mgd. Thus, the 0.3- to 0.5-mgd inflow is consistent with that expected in a system not exhibiting excessive inflow.

Early morning sewage flow to the Lincoln Village Plant varies little between summer dry weather and winter wet weather. Rubber

gasketed pipeline joints and a low groundwater table in the area can account for the minimal or nonexistent infiltration recorded.

Storm flow or inflow at the Lincoln Village Plant is difficult to ascertain. According to plant personnel, very little storm inflow comes from the Colonial Heights or Lincoln Village service areas. Whatever inflow exists is attributed to the Pacific Gardens area. As previously stated, the peak storm flow rate is estimated at approximately 3 mgd. This peak is 0.3 mgd greater than the peak dry weather flow. The normal diurnal variation on an average dry weather day would probably be 2.6 mgd. Based on the estimated wet weather flow and the normal peaking flow, we can estimate the inflow at approximately 0.4 mgd.

Smith's Canal Pump Station

The Smith's Canal Pump Station presently serves 45,000 to 50,000 people and has an average daily flow of 4.9 mgd. At several places in the Smith's Canal service area, storm catch basins are connected to sanitary sewers. During storms, the flow rate at the Smith Canal station exceeds station capacity. At those times, storm inflow is estimated at 7 to 10 mgd. After storms have subsided, however, minimum early morning flows are comparable to the summertime dry weather flow. This is consistent with the lower groundwater table in the Smith's Canal area, where minimal flows indicate slight to nonexistent infiltration into the sewer system.

In the older parts of Stockton, which is served by the Smith's Canal Pump Station and where it was historically common to combine sanitary and storm sewers, many catch basins are still connected to the sanitary sewers. A project designed to eliminate catch

basins from the sanitary sewer system is shown on Map IV-1 entitled, "Inflow Reduction Plan." It is estimated that 90% of the inflow can now be attributed to known storm catch basin connections. The estimated cost of installing additional storm sewers and disconnecting catch basins from the sanitary sewer system is $600,000.

Under the proposed project, the New Smith's Canal Pump Station would be designed to accommodate only domestic flows totaling 29 mgd. If the station were required to handle the estimated 10-mgd storm inflow as well, the total station capacity would need to be 39 mgd. The difference in capital costs between a 29-mgd station and a 39-mgd station are significant, as shown in the following analysis:

Item	29-mgd System	39-mgd System
New Smith's Canal Pump Station	$1,250,000	$1,530,000
Force Mains and Gravity Interceptor	1,540,000	1,730,000
TOTAL	$2,790,000	$3,260,000
Difference	$470,000	
Annual operation and maintenance cost of $23,700 amortized for 50 years	327,000	
Total Present Worth Value of Inflow	$797,000	

Summary

Infiltration into the North Plant and Lincoln Village Plant service areas is less than 100 gallons per acre per day and does not affect the capacity or capital cost of any of the viable alternatives. Storm inflow at these two plants is minimal and also has no effect on capacity or capital cost of the alternatives.

MAP IV-1
NORTH STOCKTON WASTEWATER FACILITY PLAN
INFLOW REDUCTION PLAN

CH2M HILL

The Smith's Canal system has significant storm inflow with a present worth value of $797,000. Approximately 90% of this inflow can be eliminated from the project at an estimated cost of $600,000. Since the cost of eliminating the storm flow is less than 90% of the present worth value of the inflow, the proposed inflow reduction project proves to be cost effective. Inflow or infiltration capacity is not included in the facilities planned for any segment of the project alternatives.

E. PROJECTED WASTE LOADS

The projected waste loads, based on data from the existing systems, are designed on the basis of an average daily flow multiplied by a peaking factor which is the ratio of the average daily flow to the peak flow on an average dry weather day. This ratio decreases as average daily flow increases. The curve showing the ratio of extreme flows to average daily flows used for the design of this project is included in Appendix C.

The peak flow rate of the peaking curve is also consistent with the peak dry weather flow of 4.7 mgd, measured on a Monday following a 3-day weekend. From these curves and supporting data, we can expect peak instantaneous flow rates during dry weather to be similar to those calculated by use of the peaking curve.

The projected waste loads for the North Stockton area, including and excluding the Smith's Canal area, are shown in Table IV-2. The North Stockton service area figures represent the waste loads anticipated from the total area, while the figures excluding Smith's Canal service area represent the waste loads which will be added to the MWQCP service area or the new North Plant service area.

Table IV-2
SUMMARY OF PROJECTED WASTE LOADS

Quantity	PROJECTED WASTE LOADS NORTH STOCKTON SERVICE AREA 1972-73	1975	1985	1995	NORTH STOCKTON SERVICE AREA EXCLUDING SMITH'S CANAL 1972-73	1975	1985	1995
Average Dry Weather Flow, mgd	8.5	9.0	12.0	15.4	3.6	4.2	7.6	10.9
Maximum Monthly Flow, mgd	10-11	10.0	14.0	18.0	5.4±	6.2	10.1	14.0
Peak Dry Weather Flow	17.0±	17.5	23.0	29.0	7.4	8.8	15.2	20.7
Peak Wet Weather Flow								
Domestic and Commercial, mgd	22.0	21.0	25.0	29.0	7.5	8.7	14.6	20.0
Infiltration/Inflow, mgd	5-9	3-8	2-5	2-5	0.5	0.5	0.7	1.0
Quality*								
BOD Loadings, 1000 lbs/day								
Average Dry Weather	17.0	18.0	24.0	30.8	7.2	8.4	15.2	21.8
Maximum Monthly	21±	20.0	28.0	36.0	11±	12.4	20.2	28.0
Suspended Solids Loadings, 1000 lbs/day								
Average Dry Weather	15.3	16.2	21.6	27.7	6.5	7.6	13.7	19.6
Maximum Monthly	18.9	16.0	25.2	32.4	9.7	11.2	18.2	25.2

*Based on average grab samples

V. AN ANALYSIS OF EXISTING WASTEWATER FACILITIES

A. TREATMENT PLANT LOCATIONS AND COLLECTION SYSTEMS CONFIGURATION

As previously discussed, there are two existing secondary treatment plants in the North Stockton area: the City's North Treatment Plant and the County's Lincoln Village Treatment Plant. These plants are both secondary treatment plants, discharging into Fourteen-Mile Slough.

The trunk sewer collection lines in the North Stockton area are shown on Map III-3. Only the trunk sewer lines are shown to depict the areas served by the present sewer system.

The Lincoln Village Plant serves three areas: Colonial Heights Maintenance District, Pacific Gardens Sanitary District, and Lincoln Village Maintenance District. Each of these districts has a separate sewage collection system and conveys sewage to the Lincoln Village Plant.

The remainder of the North Stockton area now served by sewer systems is tributary to the North Sewage Treatment Plant. In the past, sewer mains and trunk systems have been enlarged to provide trunk capacity to serve the North Stockton area at the North Treatment Plant, in conformance with the 1964-65 sewage survey and master plan.

B. WASTEWATER MANAGEMENT PROCEDURES

San Joaquin County operates and maintains the water and sewer systems within the three County service districts in the North Stockton area. Operation and maintenance personnel are headed by the County Director of Public Works and are under the immediate supervision of the maintenance District's superintendent, who

has a CPWA Grade II operator's license. Under his direction are seven District personnel, including one Grade II, a Grade III, and one Grade IV operator. A phone recorder is used in emergencies to give an emergency phone number to the maintenance individual on duty.

The City of Stockton's water and sewer system is under the direction of the Public Works Director and is supervised by the Utilities Division Superintendent. The superintendent holds a CPWA 1-A operator's license, the highest rating attainable for treatment plant operators. Under his charge is a full staff, providing 24-hour plant supervision, as shown in the staffing chart in Table V-1.

The North Plant is staffed 7 days a week, 8 hours a day. The plant control system includes alarm signals to warn of overflows or mechanical failures. The alarms sound at the MWQCP, where personnel are on duty 24 hours per day. In response to an alarm, an operator is dispatched to the North Plant to investigate and repair malfunctions. Overflow and mechanical failure alarms are also located at the North Pump Station and the Lilval West Pump Station. All sanitary pump stations in the City are equipped with alarms that sound at the MWQCP.

In addition to the reliability provided by the MWQCP being manned 24 hours per day, alarms are built into the control system that assist in quickly dispatching personnel to correct malfunctions.

C. DESCRIPTION OF EXISTING WASTEWATER TREATMENT FACILITIES

North Plant

The North Plant was constructed in 1964 and has an average daily capacity of 3.5 mgd. The plant process consists of primary treatment, followed by 71 acres of stabilization lagoons. Lagoon

SERVICE AREA BOUNDARY

INTERSTATE 5

COLONIAL HEIGHTS (COUNTY)

NORTH PUMP STATION (P.S.)

LILVAL EAST P.S.

LILVAL WEST P.S.

HAMMER LANE

NORTH PUMP STATION AREA

HIGHWAY 88

LILVAL EAST

LILVAL WEST

BENJAMIN HOLT DRIVE

SEWAGE COLLECTION TRUNK LINES

NORTHWEST STP

LINCOLN VILLAGE (COUNTY)

PACIFIC AVENUE

LINCOLN VILLAGE STP

MARCH LANE

PERSHING AVENUE

SERVICE AREA BOUNDARY

SAN JOAQUIN RIVER

STATE HOSPITAL AREA

CALAVERAS RIVER

P.S.

PACIFIC GARDENS (COUNTY)

SMITH'S CANAL PUMP STATION AREA

SMITH'S CANAL P.S.

PORT OF STOCKTON

N

0 1 MILE

LEGEND

- SEWAGE PUMP STATION
- FORCE MAIN
- COLLECTION SEWER MAINS
- TRIBUTARY SERVICE AREA

MAP III-3
NORTH STOCKTON WASTEWATER FACILITY PLAN
SERVICE AREA BOUNDARIES AND EXISTING FACILITIES

CH2M HILL

TABLE V-1
CITY OF STOCKTON
DEPARTMENT OF PUBLIC WORKS
WASTEWATER CONTROL

SUPERINTENDENT

LABORATORY SECTION
1 Chemist
2 Lab Technicians

* 1 Sani. Const. Inspector
* 1 Sani. Inspector (Structural)

ASSISTANT SUPERINTENDENT

1 Steno Clerk
(1 Clerk Typist II)

1 Industrial Waste Inspector

OPERATIONS SECTION
1 Plant Supervisor
9 Senior Operators
(9 Plant Operators)
1 Laborer

SEWER MAINTENANCE
1 Maint. Supervisor
2 Sr. Maintenance Men Operators
2 Construction Equip. Operators
(14 Maintenance Men)

MECHANICAL MAINTENANCE SECTION
1 Mechanical Supervisor
(3 Sr. Mech. Maint. Men)
4 Mechanical Maint. Men
1 Welder
1 Heavy Duty Mechanic
1 Laborer
(1 Electrician)

*For plant expansion and modification only.

Total: 60 personnel

effluent is discharged into Fourteen-Mile Slough. Sludge from the primary clarifier is digested anaerobically in a single-loaded, heated, floating cover digester. Digested sludge is wasted into a sludge pond adjacent to the digester. Table V-2 in Appendix B shows design data and loadings for the existing North Plant.

Lincoln Village Plant

This is an old primary plant which was upgraded 6 years ago to an activated sludge stabilization pond system. Raw sewage is added to the aeration cells directly without primary treatment. Excess sludge from the aerated sludge process is wasted in the 70-acre, seven-pond lagoon system. The effluent from the lagoons is chlorinated and discharged into Fourteen-Mile Slough. The plant is equipped with primary clarifiers and an anaerobic digester tank. These units, however, are quite old and are not in service at this time. The basic data and loading at the Lincoln Village Plant are shown in Table V-3 in Appendix B.

Main Water Quality Control Plant

The MWQCP has undergone a continuous program of improvement and upgrading which has enabled it to effectively treat the large industrial food-processing waste in the fall, and at the same time, treat the domestic flows. The plant is a secondary treatment facility with a tertiary addition currently out for construction bids. Completion of the present construction program will upgrade and enlarge the MWQCP to a 55-mgd advanced waste treatment plant.

Primary treatment in the plant consists of manually cleaned bar screens, grit chambers, comminutor units, and primary sedimentation tanks. Primary treatment is followed by biological

secondary treatment consisting of trickling filters (both conventional and new deep bed units utilizing synthetic media) and secondary clarifiers. Secondary effluent is then discharged into the 640-acre stabilization pond system. The new advanced waste treatment process, which is to be added soon, will consist of chemical treatment, flotation-sedimentation, filtration, chlorination, and dechlorination. This additional treatment will follow the stabilization pond treatment and should result in a very high quality effluent to be discharged into the San Joaquin River. The tertiary addition to the MWQCP will only be operated seasonally as necessary to meet discharge requirements. Table V-4 in Appendix B shows the basic data and design loading for the MWQCP.

Analysis of the alternatives in this Facility Plan assumes the plant additions presently under construction or out to bid are already in existence. As indicated in the following loading and design data, there is already sufficient capacity in the completed MWQCP for the current North service area flows. Therefore, the North service area flow affect only the timing of future expansions.

D. ANALYSIS OF TREATMENT FACILITY OPERATION AND PERFORMANCE

North Plant

The existing North Plant is being operated properly and is performing the treatment job it was designed to perform, as indicated in the monthly summary (Table IV-1, Appendix B). Its operation and performance is meeting the discharge requirements placed into effect at the time of the plant design. However, in order to meet future loadings or comply with the proposed discharge requirements, it will be necessary to (1) increase the plant's primary treatment facilities, (2) add secondary treatment, and

(3) add advanced waste treatment facilities similar to the process at the MWQCP. The existing process was not designed to meet the revised discharge requirements, particularly in regard to dissolved oxygen levels and nitrogen removal.

The treatment process has continually produced an effluent with 90% BOD removal. Due to the uncontrollable nature of a lagoon system, it is not possible for a plant of this type to consistently produce a high quality effluent. This is demonstrated by a wide range of BOD and suspended solids concentrations reported in the effluent.

Lincoln Village

The Lincoln Village Treatment Plant is presently adequately meeting the old discharge requirements, as indicated in the monthly summary (Table IV-1, Appendix B), due mainly to the action of the stabilization lagoons. In order to meet anticipated discharge requirements, it will be necessary to (1) provide new primary treatment facilities, (2) repair or replace the aerobic digester, and (3) add advanced waste treatment facilities similar to those being added at the MWQCP. A chemical tertiary treatment process might also be considered as a viable alternative at this plant.

Main Water Quality Control Plant

The existing MWQCP has been producing a good quality secondary effluent, as indicated in the monthly summary (Table IV-1, Appendix B). However, when the two additional oxidation towers AWT facilities are completed and put into service, the plant should be capable of meeting the new discharge requirements at all times, thus, mitigating the constraints of the present cease-and-desist order.

The plant is subject to very high organic and suspended solids loadings each year during the food-processing season. The treatment process, however, has been designed to accommodate these loadings. As previously stated, the plant supervisors and operators are knowledgeable and operate the plant in a most efficient manner. There are no mandatory improvements which are not being made or planned for in the near future.

The AWT processes now being constructed will be in operation by the time the facilities proposed in this plan are complete. The only meaningful effluent data, for purposes of comparison, would be with the AWT process "on line." These data will not be available for at least 2 years. However, pilot plant studies and research in the latest possible design techniques have been incorporated into the tertiary additions currently being constructed.

E. FINANCIAL ANALYSIS OF WASTEWATER TREATMENT OPERATIONS

Both the City of Stockton and San Joaquin County have complex operating budgets for wastewater treatment and maintenance. The North Stockton service area Facility Plan includes only portions of the systems operated by the City and the County. A separate financial and revenue program is currently being prepared for tertiary additions to the MWQCP. That financial and revenue program incorporates the operating and revenue information necessary for this Facility Plan.

VI. WASTE DISCHARGE AND TREATMENT REQUIREMENTS

A. INTRODUCTION

The overall water quality objectives for the North Stockton area were discussed with the Environmental Protection Agency, the State Water Quality Control Board, and the Central Valley Regional Water Quality Control Board. As a result of these discussions, and the interim basin plan, the three viable alternatives previously described, evolved. Each alternative anticipates a discharge. The Regional Board staff has proposed discharge requirements for Alternatives I and II. The discharge requirements for Alternative 3, the MWQCP discharge requirements, have been adopted by the State and Central Valley Boards. The proposed discharge requirements for Alternatives I and II into Fourteen-Mile Slough are essentially the same as those previously established for the MWQCP.

B. REQUIREMENTS FOR DISCHARGERS

The discharge requirements are now part of the NPDES permits issued under the National Pollution Discharge and Elimination System. The NPDES permits are administered by the State of California through the regional boards. The regional board staff has reviewed the alternatives and established proposed discharge requirements, which are included in Appendix C of this report in a letter to the City of Stockton dated 30 October 1973. The discharge requirements, as established at the MWQCP and proposed for Alternatives I and II, have a tremendous impact on the alternatives under consideration. The analysis of the alternatives in this Facility Plan are based on these discharge requirements.

C. WASTEWATER RECLAMATION POTENTIAL

Three significant reclamation reuse possibilities merit consideration in Stockton: (1) irrigation water for agricultural use; (2) power plant cooling water, and (3) reuse by local industry. Viewed from a basin-wide perspective, reuse of municipal and industrial (M & I) wastewater for irrigation solves an M & I disposal problem but does not benefit agriculture significantly. The total M & I water used in the Central Valley equals approximately 4% of the demand for irrigation water. Thus, reuse of all M & I wastewater would not go far in meeting agricultural demands. Except for localized, special cases, reuse by existing irrigation districts benefits the discharger only, and not the irrigation districts. Consequently, farmers are not generally willing to accept reclaimed M & I wastewater as an "equal" source of supply compared with conventional supplies. The institutional problems in this area can be formidable.

This reuse concept could change substantially if the State or EPA were to require farmers to use reclaimed M & I wastewater in order to help solve the M & I discharge problem.

Water reuse is not of immediate economic benefit to the farmer and, with the current discharge requirements, is not economical to the discharger. However, a major source of domestic and irrigation water in the Stockton area is from groundwater, which is being depleted. All current reports of water use in the Stockton area indicate groundwater is insufficient to meet demands, and out-of-basin water must be imported.

Regarding power plant cooling, all major utilities in California are looking for inland nuclear power plant sites to meet future

energy demands. The recent energy crisis and passage of the Coastal Initiative (which precludes coastal power plant construction for the near future) in November 1972 has given this search some urgency. Basin planning activities for the Central Valley show that the Atomic Energy Commission criteria would not allow nuclear plant construction in the immediate Stockton area. Furthermore, Stockton's total wastewater flow is lower than the rate demanded of cooling water in a large power plant. The salt content of the Stockton sewerage also makes its use for power plant cooling questionable economically. For these reasons, reuse for power plant cooling is not likely to be a serious consideration in the near future.

Reuse by local industry in Stockton deserves serious immediate consideration. Several large water-using industries are within a reasonable distance of the City's MWQCP. The U. S. Department of Agriculture, Food and Drug Administration criteria, places severe restrictions on many potential water users in the food-processing industry. Some industrial uses, such as cooling, clean-up, or processes outside the food industry, may be appropriate. The City of Stockton has been in contact with several local wet industrial dischargers, and they have agreed to consider the reuse of tertiary effluent planned for the City's MWQCP.

D. DEVELOPMENT OF TREATMENT REQUIREMENTS

An analysis of the plant's discharge requirements shows the level of wastewater treatment will be the same regardless of the point of discharge or the treatment plant involved. The Central Valley Regional Board staff has established tentative discharge requirements for all plants in the Stockton area discharging to the San Joaquin-Delta area. These requirements made it necessary for the MWQCP to install tertiary wastewater

or advanced wastewater treatment (AWT) processes that are currently being constructed and funded through EPA and State Clean Water funds. Upon adoption of the proposed discharge requirements for the Lincoln Village and North Plants, it will also be necessary to add advanced waste treatment facilities to these plants. The proposed regulations call for compliance with the requirements by 1 December 1976.

There are several means by which advanced waste treatment levels can be achieved. However, the most economical method for a plant with existing lagoons would be utilization of the same process used at the MWQCP. The process is outlined in the alternative analysis and is similar to that being used at the MWQCP. It forms a basis for the economic comparision of alternatives.

The treatment processes proposed and considered for study are essentially the same as those employed at the MWQCP. The effluent produced by any of the treatment alternatives will be equally compatible with future water reclamation. However, water reclamation will be contingent on the economics involved.

At the present time, the need for additional water is not sufficient to make wastewater reclamation economically feasible.

VII. PROJECT ALTERNATIVE ANALYSIS

A. INTRODUCTION

The wastewater facilities needs of the project planning area have been related to waste discharge requirements and concepts set forth in the State-approved basin plans to develop a sound wastewater management system. The identification of wastewater facilities needs required the complete identification of all problems associated with the wastewater system, the identification and consideration of alternative systems, and the screening and evaluation of these alternatives with respect to costs, environmental and social impact.

In identifying all feasible solutions available, a wide range of wastewater treatment systems, configurations, and management techniques were considered. The analysis of project alternatives is the focal point of the project report. Every effort was made to respond to the requirements of the project report guidelines set down by the State in order to assure that all viable project alternatives were identified and evaluated in terms of both economic and environmental considerations.

The following discussion reviews all of the potential alternatives for wastewater management in the project area and the data by which the favored proposed project was selected.

B. DEVELOPMENT OF ALTERNATIVES

Alternative I - Lincoln Village and North Plants

The two existing plants, Lincoln Village and North, can each be enlarged and upgraded to advanced waste treatment in order to

meet the new discharge requirements. The Lincoln Village Plant would serve the three existing service districts which are near saturation densities. The Northwest Plant would serve its present area and any expansion north of the Calaveras River.

The degree of treatment at the Lincoln Village Plant would have to be upgraded to meet the new discharge requirements. The Northwest Plant, however, would have to be both enlarged and upgraded to provide the required treatment for its service area. The North Pump Station would require enlargement and modification in the same magnitude as Alternatives I and II, except the Colonial Heights area, now tributary to the Lincoln Village Plant, would continue to be served at the County plant. This alternative may be the most politically feasible alternative.

Alternative II - North Plant

The existing North Treatment Plant would become the regional plant for the North Stockton area. This would require the existing North Plant to be upgraded to advanced waste treatment in order to conform to the new discharge requirements and enlarged to provide capacity sufficient to serve the entire North Stockton area. The entire sewer system would function basically as it does now. The absence of any major changes within the present interceptor system in this area is a result of the City's construction programs conforming to the 1964-65 sewer study.

In conformance with the 1964-65 sewer study, this alternative would consolidate the treatment of the current Lincoln Village Plant at the expanded North Plant. The interception of the Lincoln Village Treatment Plant sewage would be via a 24-inch interceptor which has been sized and is currently constructed within a few hundred feet of the Lincoln Village Plant. This

24-inch interceptor would be tributary to the Lilval West Pump Station.

The existing pump stations would require the same additional pumping capacity as Alternative III. The study of sub-alternatives is not warranted since the interception of the Lincoln Village Plant is the only change in the current system operation.

Alternative III - North-South Interceptor

Consolidation of Stockton waste treatment facilities at the MWQCP, a scheme which would require construction of a North-South Interceptor, has been suggested by the Interim Basin Plan and the Central Valley Regional Water Quality Control Board staff.

The North-South Interceptor would intercept all of the sewage generated from the North Stockton service area and convey it, along with the area currently tributary to the Smith's Canal Pump Station, to the existing Stockton Main Water Quality Control Plant (MWQCP). This project would abandon the two existing wastewater treatment plants in the North Stockton area. One, the City's existing 3.5-mgd Northwest or North Plant, and two, San Joaquin County's 1.5-mgd Lincoln Village Plant.

The interceptor alternative would include the use of the existing North and Lilval West Pump Stations and adjoining force mains. However, additional pumping capacity would need to be installed. These pump stations, through their existing force mains, would discharge into the new interceptor near Five-Mile Creek. This force main would then discharge into a gravity interceptor just north of the Calaveras River. The gravity line would then flow southward to Smith's Canal Pump Station. This major pump station would be constructed to pump the sewage as far south as necessary toward the MWQCP.

Alternative IV - Polish Effluent at MWQCP

The existing North Plant can be enlarged and upgraded to provide secondary treatment for the North Stockton service area which would allow the abandonment of the existing Lincoln Village Plant. The effluent from this North Plant would then have to be transported to the MWQCP for effluent polishing to meet the tertiary degree of treatment required for discharge. This alternative would require an interceptor to be constructed from the North Plant to the MWQCP. The interceptor would be similar to Alternative III, except the project design flows would be approximately 30% less since the North Plant would be used to dampen peak flows.

The reduction of design flow by 30% would only constitute approximately a 10% reduction in project costs. The continuance of the Northwest Plant would result in a higher maintenance cost than consolidation of treatment. The long-term environmental and social impacts would be more severe by continuing the North Plant in proximity to the residential areas. This alternative, which would continue operation of the North Plant and convey the effluent to the MWQCP for polishing, has most of the disadvantages of Alternatives I, II, and III. In addition, it would not be as economically cost effective since it would require the capital cost of an interceptor project.

Alternative V - No Project

The two existing plants would continue to provide the current degree of treatment and no relief would be provided by any interceptor to the MWQCP. Growth in the North Stockton area would be limited to about its present level. Neither of the two existing plants meet or can meet the revised discharge requirements, the minimum discharge standards as proposed by

the Central Valley Regional Water Quality Control Board, nor the level of treatment set forth in the Federal Water Pollution Control Act Amendments of 1972.

The State Department of Finance has projected growth in the San Joaquin County and Stockton area based on the D-150 curve. The City of Stockton and San Joaquin County have adopted zoning ordinances and general plans to provide for the anticipated growth. The zoning and general plans provide for 80% to 90% of the growth in the Stockton area to take place in the North Stockton service area.

A "no-project" alternative would: (1) continue the degradation and pollution of the surface waters; (2) provide a substandard discharge; and (3) would force the growth anticipated by the Department of Finance outside of the local planning agency's anticipated growth area.

Alternative VI - No Growth - Upgrade Existing Plants

The two existing plants could be upgraded to provide the required degree of treatment for the present flow rates of the service area. This would limit the growth in the North Stockton area to its present level, but would improve the water quality in the area. As in Alternative V, this no-growth alternative would force the anticipated growth as projected by the Department of Finance to take place in areas contrary to local planning and zoning.

Alternative VII - New North Plant

The 1964-65 Brown & Caldwell sewer survey anticipated two treatment plants north of the Calaveras River. One, which is the existing North Plant, and a second regional plant in the

Disappointment Slough area. The new North Plant, some distance from the City, would provide a better odor buffer and would discharge into the San Joaquin River further downstream. The new North Plant could be constructed in lieu of the then anticipated Disappointment Slough Plant and also consolidate the service area of the existing North Plant.

This alternative would require the abandonment of the Lincoln Village Plant and existing North Plant. A major interceptor would be constructed to intercept the sewage from the two existing plants. Additional pumping capacity would be needed at the Lilval West and North Pump Stations similar to Alternatives II and III.

If the construction of a major interceptor and abandonment of the two existing treatment plants is the most cost-effective alternative, undoubtedly the most cost-effective interceptor-type project would be the consolidation of treatment at the MWQCP. The construction of a new North Plant would, no doubt, have larger maintenance costs and similar or higher construction costs. Therefore, Alternative III is the only interceptor alternative that merits detailed investigation.

Alternative VIII - New Stockton Regional Plant

The existing MWQCP is located in the southwest area of the City. A new regional plant to serve the entire City might be located in a central, environmentally acceptable location. This Facility Plan assumes the Stockton regional MWQCP, which has been thoroughly studied by competent consulting engineers and is currently placed in the most cost-effective location. The MWQCP has received EPA and State Clean Water Grants for its present location. The receipt of such funds requires not only the review of both State

and Federal agencies, but also several local review agencies. The plant location is consistent with the Interim Basin Plan and in accordance with the Central Valley Board and the basin planners.

The construction of a new regional plant for the Stockton area would require the abandonment of some $50 million worth of publicly funded projects. This alternative appears not to be a cost-effective solution and is considered a politically infeasible alternative.

Alternative IX - San Joaquin County Regional Plant

This alternative would require the construction of a super regional plant to serve all metropolitan areas in the entire San Joaquin area. The consolidation of all treatment plants in San Joaquin County into one wastewater treatment plant may be a viable alternative several decades in the future. Although the study of consolidation and regionalization into such super wastewater plants is within the scope of the Interim Basin Plan and the studies of the basin planner, neither anticipates such a plant being constructed.

C. SCREENING OF ALTERNATIVES

The North Stockton Wastewater Facility Plan must show that a thorough investigation and study has been done to determine the most cost-effective means of providing sewage treatment and disposal for the projected population in the North Stockton area. Alternatives I through III will provide the necessary service, are considered viable alternatives, and will be thoroughly investigated in the Facility Plan.

Alternatives IV through IX are considered either economically, environmentally, or socially infeasible and will not be investigated further.

Nearly $500,000 has been spent on studies affecting the Stockton area over the years. Only minor modifications and changes have been made to previous studies and the basic conclusions drawn when the studies were completed have proven to be valid. Alternatives IV through IX are contrary to these studies and not consistent with local planning and zoning for the area.

The interceptor alternative, Alternative III, should be designed for a minimum 20-year growth projection. The City and County planning agencies, in conformance with the Department of Finance, have prepared projections for 1995 year population. Therefore, the 1995 (20 years following the 1975 project startup) population projections by these agencies will be used as the design life for the interceptor. The other two viable treatment alternatives will also be based on a 20-year projection in order to equitably compare alternatives. It is fully understood that it may not be economically feasible to construct treatment facilities that will serve 20 years into the future.

D. DETAILED ANALYSIS OF THE MORE VIABLE ALTERNATIVES

1. REFINEMENT AND DETAILED DESCRIPTION OF VIABLE ALTERNATIVES

Alternative I - Lincoln Village and North Plant

The two existing plants, Lincoln Village and North Plants, can be enlarged and upgraded to advanced waste treatment in order to meet new discharge requirements, as shown in the following process flow diagrams for the two plants.

The Lincoln Village Plant would be upgraded and expanded to a 1.6-mgd average daily flow advanced waste treatment plant that would discharge into Fourteen-Mile Slough. The North Plant would be upgraded and expanded to a 9.3-mgd advanced waste treatment plant, also discharging into Fourteen-Mile Slough. The expanded plants would make use of all existing facilities which were in good working order and would merge with the latest applicable treatment features. The basic treatment process would be the same as that currently under construction at the MWQCP, which has been found to be most effective in meeting water quality objectives in the area. This process would consist of the following:

Conventional treatment consisting of primary sedimentation followed by a biological secondary process.

Stabilization lagoons.

Advanced waste treatment with algae removal by flotation-sedimentation, filtration, chlorination, and dechlorination.

Design criteria established at the MWQCP for domestic flows are the basis for the design and costs of this plant. Other processes might prove to have a lower or higher initial construction cost at Lincoln Village Plant site. However, consideration of both capital investment and operation and maintenance costs should reveal no significant difference.

Alternative II - North Treatment Plant

In this alternative, the existing North Treatment Plant would become the regional plant for the North Stockton area. This would require the existing North Plant to be upgraded to 10.9-mgd

advanced waste treatment in order to conform to new discharge requirements for the entire North Stockton area.

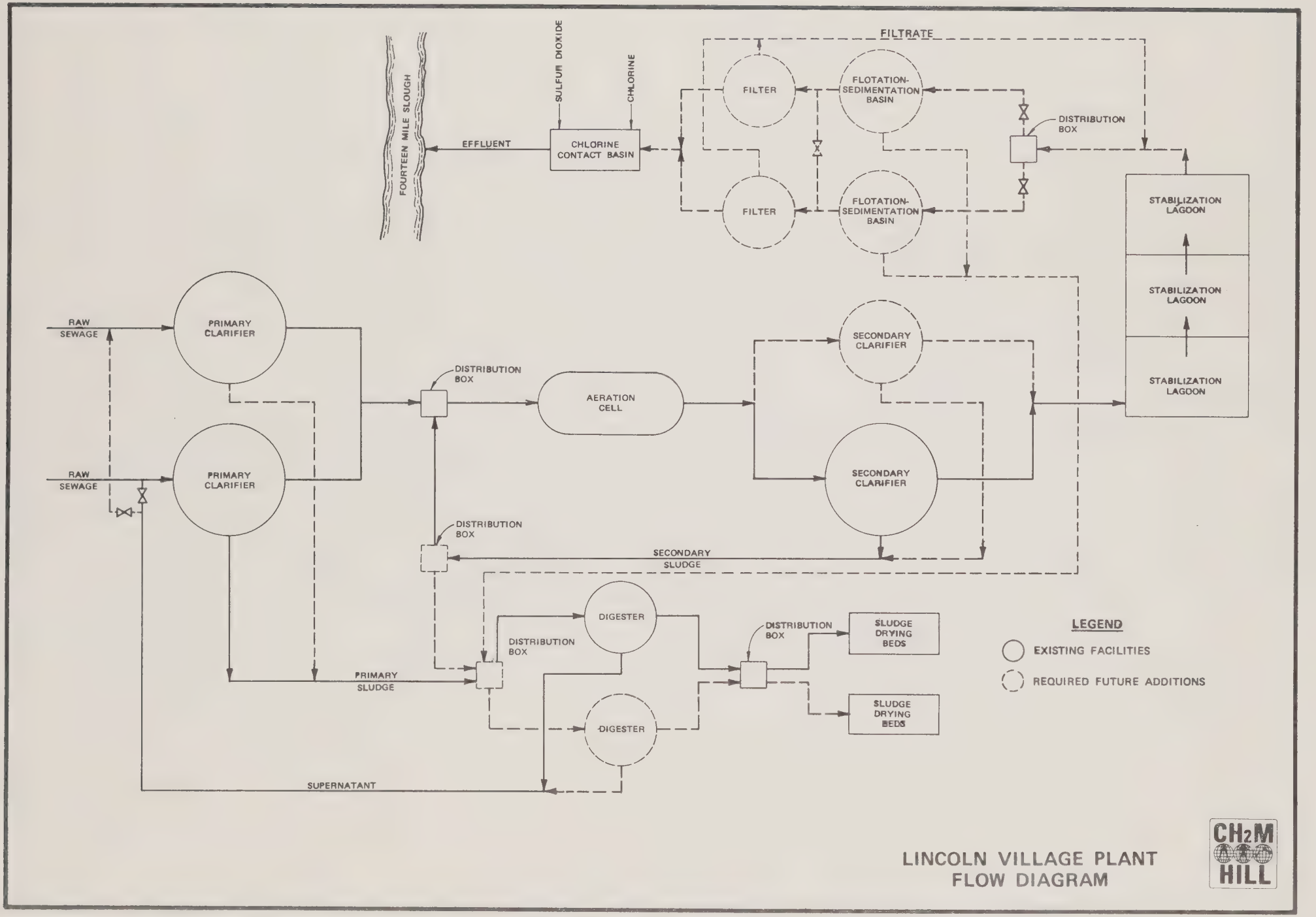
In conformance with the 1964-65 sewer study, this alternative would consolidate the treatment of the current Lincoln Village Plant at the expanded North Plant. The interception of the Lincoln Village Treatment Plant sewage would be via a 24-inch interceptor which is currently constructed within a few hundred feet of the Lincoln Village Plant. This interceptor would be tributary to the Lilval West Pump Station. The existing pump stations would require the same additional pumping capacity as Alternative III.

The sewage flows from the North Stockton service area are expected to continue to contain the same elements that are presently being observed. Therefore, conventional domestic sewage treatment facilities will be sufficient to meet discharge requirements. The North Treatment Plant would be enlarged and upgraded to serve the North Stockton service area, which in 1995 is expected to contain approximately 109,000 people.

The new treatment plant would make use of all possible existing facilities. The new plant would utilize the same treatment process in use at the MWQCP. Rigorous investigations have been made to determine the best process for the main Stockton plant. Assuming the same people will be operating any new plant, the best overall efficiency would be obtained from a similar process. The basic processes are:

Conventional treatment consisting of primary sedimentation followed by a biological secondary stage.

Stabilization lagoons.



LINCOLN VILLAGE PLANT FLOW DIAGRAM

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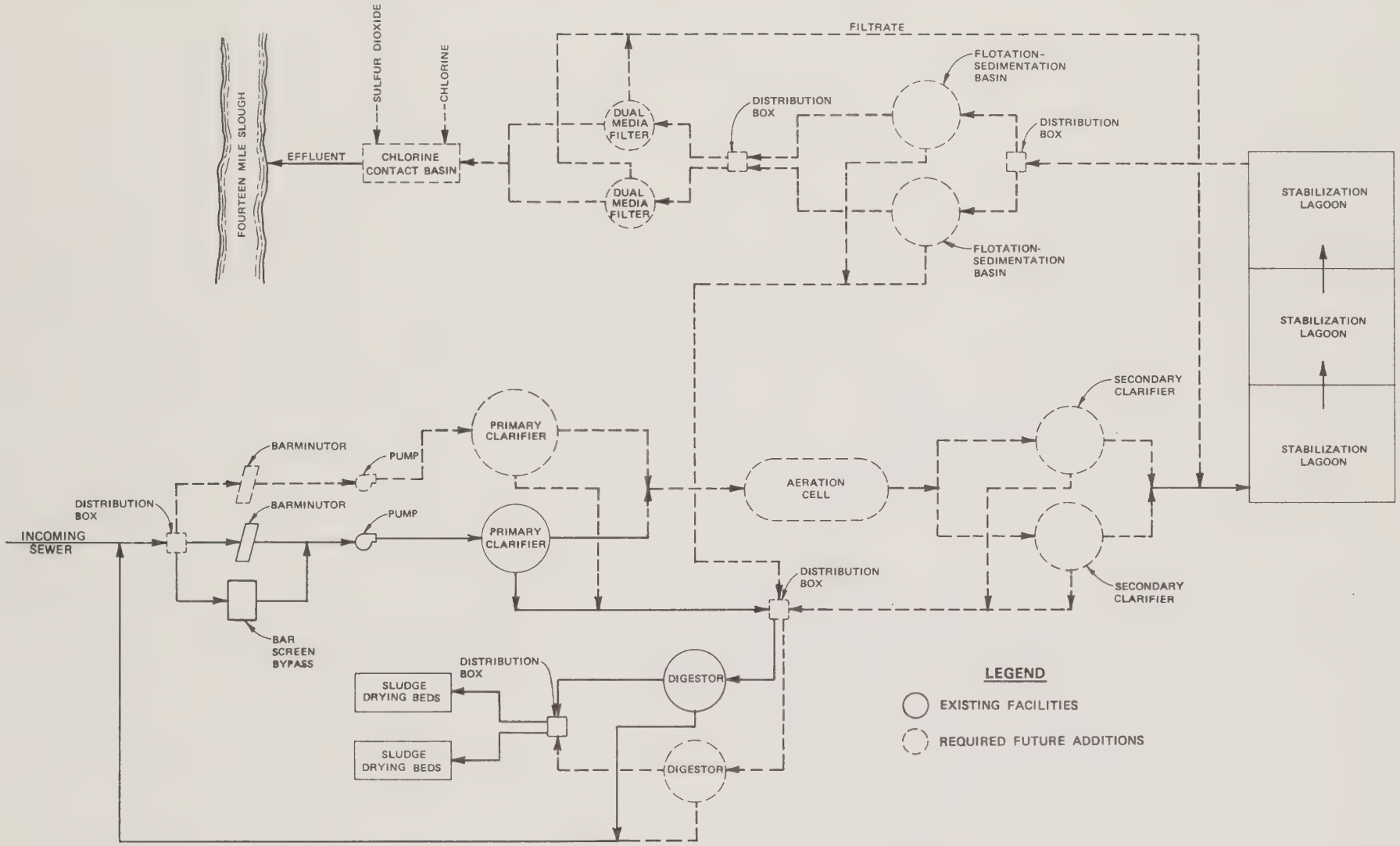
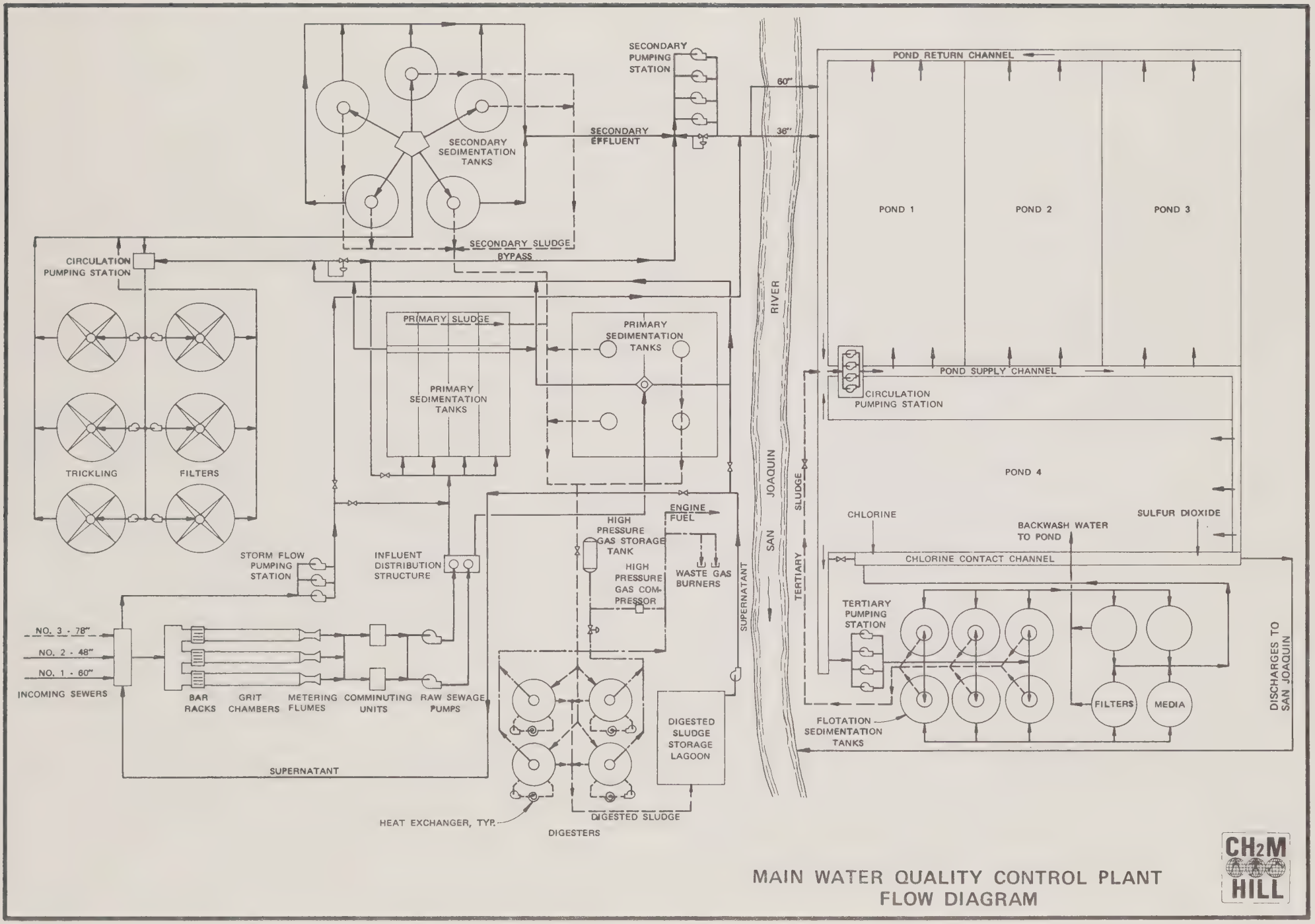


NORTH PLANT
FLOW DIAGRAM

CH2M HILL



MAIN WATER QUALITY CONTROL PLANT FLOW DIAGRAM

CH2M HILL

Advanced waste treatment consisting of algae removal by flotation-sedimentation, filtration, chlorination and dechlorination.

The plant would have an average daily capacity of 10.9 mgd with process as shown on the flow diagram.

The areas north of the Calaveras River would be diverted, where necessary, to the North Plant. The Pacific Gardens area might discharge into the Smith's Canal Pump Station zone or into the Lilval West Pump Station, as in the Lincoln Village area. Both alternatives would require the use of the existing Pacific Gardens Pump Station. Conversion of the Pacific Gardens Pump Station into the Smith's Canal zone would require the construction of approximately 6,000 feet of force main to the Smith's Canal Pump Station until sufficient capacity is available in the City's existing system. Based on additional costs, the most cost-effective connections to the Pacific Gardens area is into the Lilval West system. However, if Alternative II is found to be the most cost effective, a thorough investigation into the conditions of the existing Pacific Gardens Force Main and Pump Station might prove another alternative to be more cost effective.

In summary, Alternative II would call for construction of a new North Treatment Plant which would become the regional treatment plant for the North Stockton service area and discharge into Fourteen-Mile Slough.

Alternative III - North-South Interceptor

The North-South Interceptor would intercept all of the sewage generated from the North Stockton service area and convey it,

along with the area currently tributary to the Smith's Canal Pump Station, to the existing Stockton MWQCP. This project would abandon the two existing wastewater treatment plants in the North Stockton area.

The interceptor would include the use of the existing North and Lilval West Pump Stations and adjoining force mains, as well as additional pumping capacity which would be installed. These pump stations, through their existing force mains, would discharge into the new interceptor near Five-Mile Canal. This force main would then discharge into a gravity interceptor just north of the Calaveras River. The gravity line would then flow southward to the Smith's Canal Pump Station. This major pump station (approximately 29 mgd) would be constructed to pump the sewage as far south as necessary toward the MWQCP.

A number of sub-alternatives are possible within the scope of Alternative III. They are:

Conversion of the North Treatment Plant.

Conversion of the Lincoln Village Treatment Plant.

Service to State hospital area.

Smith's Canal Pump Station.

Crossing the Stockton Deep Water Shipping Channel.

A discussion of each sub-alternative follows.

Conversion of the North Treatment Plant:

The existing Lilval West and North Pump Stations discharge into a common 24-inch force main to the existing North Treatment Plant. All of the sewage flowing to the North Treatment Plant is pumped through these stations. These existing stations could discharge into the new force main by connecting the interceptor force main into the existing 24-inch force main near the west side of Swenson Park golf course as shown on the project map.

The North Pump Station was constructed in 1964 in conjunction with the North Treatment Plant. The station has two existing 10-inch pumps with 40-hp squirrel cage induction wound rotor motors and one 250-hp engine-driven 16-inch pump. Flow-pacing equipment is included for all pumps. The 40-hp pumps each have a capacity of 3,500 gpm at 28 feet, and the engine-driven pump is rated at 9,000 gpm at 72.5 feet at 1,000 rpm. The two smaller pumps handle normal daily flows. The large engine-driven pump provides capacity during a power outage and the peak flows. The effective capacity of the station with the largest pump out of service is 11.5 mgd. The effective capacity of the station discharging into the interceptor will be 15 mgd with the addition of one 16-inch pump for which space was provided in the original construction.

The Lilval West Pump Station is a package can-type station which was constructed in 1967 to serve the Lilval West service area. The station has space for three 8-inch pumps, two of which were installed initially. Auxiliary power is also provided at the station for emergencies. The Lilval West Station has two existing 8-inch pumps with 40-hp variable speed motors. Each pump is rated at 1,820 gpm at 75 feet. The effective capacity of the station with one pump out of service is 2 mgd. The

addition of a third pump will increase the effective capacity to 3 mgd into the new force main.

The 3.0-mgd effective capacity at Lilval West is sufficient to serve the Lilval West and Lincoln Village areas. The 15.0-mgd effective capacity of the North Pump Station will be sufficient to serve the remaining areas north of the Calaveras River, except for the State hospital and Lilval East areas. The Colonial Heights sewage is currently treated at the Lincoln Village Treatment Plant. It would flow by gravity into the expanded North Pump Station service area. The Lilval East area would require its own small pump station to pump into the existing 24-inch force main which is connected to the new interceptor. The State hospital area will flow by gravity into the interceptor near the Calaveras River.

The North Treatment Plant influent would be diverted to the interceptor by providing the additional pumps in the existing stations and connecting the new interceptor to the existing 24-inch force main. The addition of one pump at each station is required to provide capacity for the design population.

Conversion of Lincoln Village Treatment Plant:

The Lincoln Village Sewage Treatment Plant serves three areas: Pacific Gardens, Colonial Heights, and Lincoln Village. Pacific Gardens is south of Smith's Canal and pumps its sewage to Lincoln Village. The Colonial Heights area is north of Hammer Lane and pumps its sewage to Lincoln Village Treatment Plant. The Lincoln Village area flows by gravity across Interstate 5 to the plant.

The Colonial Heights area can flow by gravity into the 16-inch gravity line tributary to the North Pump Station area. Conversion

cost is estimated at $40,000. The Pacific Gardens force main can be connected to the new interceptor near the Calaveras River at an estimated cost of $85,000. The consolidation of these two areas is fairly straightforward. Service of the Lincoln Village area can be provided in several ways.

The sewage from the Lincoln Village area might:

1. Flow by gravity to the interceptor at Fourteen-Mile Slough.

2. Be pumped into the force main interceptor near Fourteen-Mile Slough by constructing a new pump station.

3. Flow by gravity to the Lilval West area and be pumped by the existing Lilval West Pump Station into the force main and interceptor.

If the new interceptor was a gravity line at Fourteen-Mile Slough, which would provide gravity service to the Lincoln Village area, the interceptor would be approximately 25 feet deep in the area of Smith's Canal. To avoid the excessive depth, an additional pump station would be required on the interceptor. The cost of the additional depth of the interceptor is estimated at $220,000.

A new pump station to provide service to the Lincoln Village area would pump the sewage into the new force main near Fourteen-Mile Slough. The new pump station could be constructed in the existing sewage treatment plant or just north of Fourteen-Mile Slough on the east side of Interstate 5. The cost of a new pump station to serve the Lincoln Village area is estimated at $220,000, plus annual operation and maintenance costs.

The third alternative is to allow the sewage from the Lincoln Village service area to flow by gravity into the existing gravity line which is tributary to the Lilval West Pump Station. As previously stated, the Lilval West Pump Station has sufficient capacity with the addition of a third pump to serve the area. These facilities have sufficient capacity because the City of Stockton, in accordance with the 1964-65 sewage study, has anticipated the abandonment of Lincoln Village Plant and the flow from the plant to go to the North Plant via Lilval Pump Station. The cost of an additional pump is estimated at $85,000 and the connection to the gravity system another $60,000. The operation and maintenance cost for pumping the flow attributed to Lincoln Village is estimated at $2,500 per year. Present worth value of $2,500 at 7% for 50 years is $35,000. The present worth value of the O&M plus the $145,000 conversion cost totals $180,000. Conversion via the Lilval West Station is the most cost effective of the three alternatives.

Sewage from the Colonial Heights area will flow by gravity into the existing North Pump Station. The Pacific Gardens area will be served through the existing pump station, which will discharge into the new interceptor near the Calaveras River. The most cost-effective alternative for providing service to the Lincoln Village area is to allow the sewage to flow by gravity into the Lilval West service area. The estimated project cost for converting the areas currently tributary to the Lincoln Village Plant into the interceptor is estimated as follows:

Area	Estimated Interceptor Conversion Costs
Colonial Heights	$ 40,000
Pacific Gardens	85,000
Lincoln Village	
Lilval West Pump Addition	85,000
Gravity Connection	60,000
TOTAL ESTIMATED CONVERSION AMOUNT	$270,000

Service to State Hospital Area:

In recent years, the State hospital, which was used as a mental institution, was abandoned and is now in private hands. Its owners intend to develop it in accordance with the City's master plan and zoning. The State hospital area will ultimately be served by interceptors flowing toward Interstate 5. Temporarily, the area east of Pershing Avenue will continue to flow southward into the Smith's Canal zone. The 18-inch line serving this area has substantial hydrogen sulfide damage and is in poor condition. This Facility Plan anticipates the area north of the Calaveras River and east of Pershing Avenue to flow by gravity toward Interstate 5. The State hospital area is also transversed from east to west by the East Bay Municipal Utility District's main water transmission lines. These three lines are approximately 100 inches in diameter and have approximately 5 feet of cover. They represent a major restriction to gravity service in the State hospital area.

Gravity service could be provided to the State hospital area just north of the East Bay pipelines or a separate pump station could serve the area by pumping into a force main interceptor. The cost of a separate pump station is estimated at $180,000. The preliminary alignment of the interceptor would be of sufficient

depth at the Calaveras River to provide gravity service to the area. The gravity interceptor south of the Calaveras River to the Smith's Canal would be of sufficient depth, due to the limitations of existing facilities, to provide gravity service to the hospital area north of the Calaveras River.

Smith's Canal Pump Station:

The new interceptor project requires a major pump station between the Calaveras River and the Stockton Deep Water Channel. The extremely flat terrain prohibits an economic or environmentally acceptable installation of a gravity interceptor from Five-Mile Creek to beyond the Deep Water Channel. A 21-mgd pump station could be constructed to serve the area north of the Calaveras River which would exclude the Smith's Canal area. The new 21-mgd pump station requires a 36-inch force main and a 39-inch gravity outfall to the MWQCP.

The existing Smith's Canal Pump Station was converted into a pump station from a primary treatment plant in 1960. The original treatment plant was constructed in 1936. There are four 8-inch pumps with 50-hp motors for a maximum capacity of approximately 15 mgd. Chlorine injection facilities are also included at the existing facility for odor control.

The station, although well maintained, is, nevertheless, nearly 40 years old and the pumps are nearly 15 years old. Normal life expectancy of a station is 50 years, with a 15- to 25-year life expected for equipment. With this in mind, the City expects to replace the entire station within 10 years. The current construction cost of a new 9.4-mgd station at Smith's Canal, designed to handle only domestic flow, is estimated at $650,000.

Construction of a new pump station at Smith's Canal to take over domestic flows from the area would allow the abandonment of the existing station and eliminate the need for reconstruction of the existing station. In addition, the existing 30-inch Smith's Canal force main, which is in satisfactory condition, could continue to serve out its useful life. By combining flows, construction of a new station allows a portion of the sewage from the North area to be conveyed through the existing 30-inch force main which is now being used by storm flow. By so doing, the size of the new force main can be reduced from a 36-inch to a 30-inch line, eliminating the need for an entirely separate system.

The following table compares the cost for separate stations with the cost of a combined station at Smith's Canal:

TABLE VII-1

COMPARISON OF COSTS

SMITH'S CANAL PUMP STATION ALTERNATIVE

Facility	Separate Projects	Combined Projects
CAPITAL COSTS		
New Smith's Canal Pump Station	$ 965,000	$1,250,000
Rebuild Existing Pump Station (in 10 years - Domestic Only)	650,000	-
New Force Main	560,000	510,000
New Gravity Interceptor	230,000	210,000
Deep Water Channel Crossing (same)	-	-
Subtotal	$2,405,000	$1,970,000
O&M COSTS (50 YEARS)		
New Pump Station	406,000	526,000
Rebuild Existing Pump Station (Domestic Only)	248,000	-
Pipeline	88,000	80,000
Existing Pump Station Equipment Replacement	64,000	-
Subtotal	806,000	606,000
TOTAL	$3,211,000	$2,576,000
Difference	$635,000	

In summary, the combined project, which calls for the construction of a new 29-mgd pump station, is the most cost effective. The combined station provides a savings of $432,000 in capital costs and $200,000 in O&M costs for a total present worth savings of $635,000. Recognizing the condition of the existing station and the fact that the proposed interceptor and pump station would

be built in the immediate vicinity, we cannot ignore the consideration of the cost-effective value of a combined project. The existing station is old. Construction of a single station allows the future domestic sewage flows from north of the Calaveras River to be conveyed through the existing force main, which is currently being used substantially for storm inflow. The storm inflow would be disconnected from the sanitary sewer system prior to the population growth projected for the year 1995. The combined system would provide a backup for peak flows. During low flow seasons, one pipe could be taken out of use for maintenance or repairs, providing a higher degree of reliability. The proposed project includes construction of a 29-mgd station. Its cost effectiveness is the reason for including the Smith's Canal area in the Facility Plan.

Crossing the Stockton Deep Water Shipping Channel:

The Stockton Deep Water Channel has an official depth of 30 feet below the mean low at low water (MLLW). In the immediate vicinity of the port and the confluence of the channel in the San Joaquin River, the design depth is 35 feet. The Corps of Engineers has preliminary plans to increase these depths by 5 feet. In order to provide adequate protection for the sewage pipeline, the invert of the pipe would have to be provided with a minimum of 5 feet of cover. These conditions demand a pipeline with an invert 45-55 feet, depending on the tide, below the water surface. Therefore, as can be seen, the Stockton Deep Water Channel is a major obstacle in constructing the North-South Interceptor.

The alternatives available in crossing the channel are: (1) the proposed routing which is fairly direct from the Smith's Canal to the MWQCP, crossing the channel at the westerly end of the

port, and (2) following a parallel routing along the existing Smith's Canal force main, crossing the Deep Water Channel and Mormon Slough east of the deep water turning basin. Channel depth is 10-15 feet shallower in this area. The trade-offs in the alternatives essentially amount to the expense of crossing the deeper channel at the west end of the port compared with the cost of the additional length of pipe to allow a more shallow crossing of the channel and slough at the east end of the port.

The direct routing would connect to the headworks at the main plant. The parallel routing would connect to a new interceptor which would serve the south end of the Stockton area. This interceptor is anticipated to be a 72-inch pipe and is listed as a possible 1974-75 Clean Water Grant eligible project.

The following table compares the costs of direct routing with parallel routing around the east end of the turning basin:

TABLE VII-2
DEEP WATER CHANNEL CROSSING
COST COMPARISON

Item	Parallel Routing	Direct Routing
30" Force Main	$ 618,000	$ 510,000
36" Gravity	300,000	210,000
Pavement and Underground Utilities	210,000	30,000
Capacity in New 78" Gravity Interceptor (20%)	240,000	-
Channel Crossing	350,000	600,000
Mormon Channel Crossing	120,000	-
TOTAL	$1,838,000	$1,350,000

The most cost-effective routing is the direct routing across the Deep Water Shipping Channel and through Port Stockton.

Summary Alternative III:

The North-South Interceptor would intercept the sewage currently flowing to the North Plant by connecting to the existing force main between Lilval West and North Pump Stations. These stations pump the entire flow tributary to the North Plant. Colonial Heights area will be diverted into the North Pump Station system. The Lincoln Village area will be diverted into the Lilval West system. The State hospital area will flow by gravity into the interceptor north of the Calaveras River. The Pacific Gardens force main will be rerouted to the interceptor near the crossing of the Calaveras River. A new pump station will be constructed at Smith's Canal to include the existing domestic flows in the area. The most economical routing from the new station is directly across the Deep Water Channel and Port Stockton to the MWQCP.

2. ANALYSIS FOR CONFORMANCE WITH IDENTIFIED CONSTRAINTS

For any alternative to be considered viable, it must conform to the identified constraints or meet the objective and discharge requirements. The proposed alternatives must conform to the water quality needs of the area, and the approved basin plan.

The objectives of the State Interim Basin Plan are detailed in the proposed discharge requirements, included in the Appendix. These discharge requirements, recommended by the staff of the Central Valley Board, are pursuant to the water quality objectives of the San Joaquin, Sacramento, Bay Delta.

The two treatment plant alternatives, I and II, are proposed to include tertiary treatment in order to conform to the water quality objectives and constraints of the proposed discharge

requirements. The interceptor alternative also conforms to the water quality objectives of the area and the identified constraints set for the existing discharge requirements for the MWQCP. The constraints which are of the most immediate concern and also the most costly, are the nitrogen, dissolved oxygen limits, and total dissolved solids (TDS). The existing and proposed discharge requirements state that dissolved oxygen shall not fall below 5 mg/l except where reduction occurs as a result of natural causes in the receiving water; the discharge shall not cause the total nitrogen concentration in the receiving waters to exceed 3 mg/l; and the total dissolved solids (TDS) of the receiving waters shall not increase above 500 mg/l. All of the alternatives considered as viable will meet the proposed discharge requirements.

The Federal Water Pollution Control Act Amendments of 1972 require the future implementation of the best practical treatment and eventually the best available treatment by approximately 1980. All of the proposed alternatives offer a degree of treatment beyond secondary. However, in order to meet the possible future requirements, an even higher degree of treatment process may be required. All of the alternatives should be adaptable to the technology of the time. However, it is obvious that consolidation of treatment, as proposed by the interceptor alternative, would provide the highest degree of adaptability to any future treatment requirements since the discharge would be concentrated at one source.

3. ECONOMIC ANALYSIS

The economic comparison is on a present worth basis. The present worth capital costs include all proposed initial improvements and the present worth of any major additions or expansion within the next 20 years. All capital costs for expansion include

credits for existing facilities which have a remaining useful life. The O&M costs include the present worth of annual power, maintenance, monitoring, and other miscellaneous costs and also the present worth value of major mechanical equipment replacement costs about every 10 to 15 years over the 50-year life of the project.

The interest rate used is 7% as outlined in the EPA requirements. Inflation, which will undoubtedly continue, is not considered.

The cost of facilities existing or under design is considered an expended or sunk cost. Many of these existing facilities still have outstanding bonds which must be repaid regardless of future improvements and growth.

Table VII-3 summarizes the costs of each viable alternative. Each item in the table is treated in subsequent discussions.

TABLE VII-3
SUMMARY OF COSTS OF VIABLE ALTERNATIVES

Items Relative to Alternative Comparison of Sewage Service to North Stockton Service Area	Present Worth Amounts Alternative I	Alternative II	Alternative III
CAPITAL COSTS			
1. MWQCP	$ -	$ -	$ 3,560,000
3. North Plant	7,550,000	8,100,000	-
3. Lincoln Village Plant	1,960,000	180,000	185,000
4. North-South Interceptor	-	-	3,885,000
5. Smith's Canal Pump Station	330,000	330,000	1,250,000
6. Lilval West Pump Station	-	85,000	85,000
7. North Pump Station	170,000	180,000	180,000
8. State Hospital Area Pump Station & Force Main	250,000	250,000	-
9. Sale of Property	-	(150,000)	(270,000)
	$10,260,000	$ 8,975,000	$ 8,875,000
O&M COSTS (Present Worth Value of 50 Years)			
1. MWQCP	-	-	3,356,000
2. North Plant	6,236,000	7,205,000	-
3. Lincoln Village Plant	2,600,000	-	-
4. North-South Interceptor	-	-	150,000
5. Smith's Canal Pump Station	248,000	248,000	510,000
6. Lilval West Pump Station	55,000	90,000	86,000
7. North Pump Station	240,000	262,000	262,000
8. State Hospital Area Pump Station & Force Main	45,000	45,000	-
9. Colonial Heights Pump Station & Force Main	30,000	-	-
	$ 9,454,000	$ 7,850,000	$ 4,364,000
TOTAL ESTIMATED PRESENT WORTH AMOUNT	$19,714,000	$16,825,000	$13,239,000
Percentage Above Alternate III	49%	27%	-

Item 1 - Main Water Quality Control Plant

The MWQCP is currently being expanded to a 55-mgd/ADF advanced waste treatment plant to provide treatment for the existing service area. The MWQCP's existing service area includes Metropolitan Stockton south of the Calaveras River, except for the Pacific Gardens area. The MWQCP currently has sufficient capacity to provide treatment of present flows totalling approximately 3.6 mgd/ADF generation for North Stockton service area.

Future expansions are planned in 5 to 10 years to increase the MWQCP capacity from 55 to 86 mgd/ADF to serve the existing MWQCP service area. The addition of the North Stockton service area will require capacity at the MWQCP to be increased from 55 to 97 mgd/ADF.

The estimated cost to expand the plant to 86 mgd is $11 million and $18 million for 97 mgd. These costs consider expanding an existing 55-mgd plant at 1974 construction prices. The present worth of the incremental difference in expansion costs planned in 10 years at 7% interest is $3,560,000.

The operations and maintenance costs are projected on the same basis.

Item 2 - North Plant

The estimated capital cost of expanding the North Plant from a 3.5-mgd/ADF secondary treatment plant to a 10.9-mgd/ADF tertiary plant is $8,100,000, as indicated in Alternative II, and $7,550,000 for a 9.3-mgd/ADF tertiary plant, as indicated in Alternative I.

Item 3 - Lincoln Village Plant

Alternative I sets the capital cost of expanding the existing secondary plant to a 1.6-mgd/ADF advanced waste treatment plant at $1,960,000. The other alternatives anticipate phasing out of the Lincoln Village Plant.

Alternative II also provides for the abandonment of the Lincoln Village Plant and the improvement costs are estimated at $180,000. The cost breakdown includes $140,000 to connect both the Pacific Gardens and Lincoln Village areas to the Lilval West system, and $40,000 to connect Colonial Heights into North Pump Station service area.

Alternative III provides for phasing out of the sewage treatment plants at a cost of $185,000. The cost includes $85,000 for connecting Pacific Gardens force main to the new interceptor; $60,000 for connecting the Lincoln Village area into the Lilval West Pump Station service area, and $40,000 for connecting Colonial Heights into the North Pump Station system.

Item 4 - North-South Interceptor

The interceptor improvement costs are itemized further in the Facility Plan. The O&M costs are estimated at 1/2% of the construction cost per annum.

Item 5 - Smith's Canal Pump Station

Alternative III includes the capital cost of a New Smith's Canal 29-mgd (peak flow) pump station. Alternative I and Alternative II consider replacement of the nearly 40-year-old structure in 10 years with a 9.4-mgd peak flow station. The 9.4 mgd is sufficient to handle only domestic flow and excludes storm inflow.

The O&M costs include annual maintenance, power, operation, miscellaneous replacement costs, and replacement of the major mechanical equipment about every 15 years.

Item 6 - Lilval West

The capital costs include the cost of increasing the station capacity to 3.0 mgd in Alternative III and 4.6 mgd in Alternative II. In each alternative, an additional pump, motor, and controls would be installed in the existing package station. The cost in each alternative is approximately the same because the dynamic head is less in Alternative II, allowing the same horsepower motor to be used in each case. Alternative I would not require a pump addition to carry the flow from the existing service area.

The O&M costs in each alternative primarily reflect the difference in power cost and greater mechanical equipment in Alternative II and Alternative III. The O&M cost is based on the entire station while the capital costs are based on improvements only.

Item 7 - North Pump Station

The capital costs for improvements include the addition of one engine-driven pump, control, recorder, and odor control equipment in the existing structure to provide for the design flow. The difference in alternative costs reflect a potentially lower installation cost as a result of not including Colonial Heights in Alternative I.

Essentially, the O&M costs only reflect the differences in power costs.

Item 8 - State Hospital Area Pump Station and Force Main

The old State hospital area can be served by a gravity system in Alternative III. Alternatives I and II would require a separate pump station and force main for the area. The cost of these facilities are included only as a means of equalizing the service benefits in each alternative. The construction of the pump station and force main is not anticipated in the immediate future. Therefore, only the present worth of the $490,000 facility constructed 10 years in the future is included in the analysis.

Item 9 - Sale of Property

The sale of the existing property occupied by the treatment plants is considered an asset and, therefore, included in the analysis. Lincoln Village's 75+ acres was valued at approximately $2,000 per acre or $150,000. The North Plant's 117 acres was valued at a little less than $1,000 per acre or $100,000. The cost includes some allowance for converting to other uses.

Item 10 - Colonial Heights Pump Station and Force Main

The continuation of the Colonial Heights Pump Station and force main would be required if treatment were to be continued at the Lincoln Village Plant.

Summary

Alternative III is the most economical. Initial capital expenditure is not a significant differentiating factor when comparing the three alternatives, since they differ little. However, Alternative III is shown to be substantially less costly in terms of operation and maintenance expenditures over the years.

Alternative I - Lincoln Village and North Plant:

This alternative would require only the expansion of the two existing plants. No new interceptor line would be necessary. Odor problems associated with this alternative, however, would probably continue.

With the exception of short-term construction disturbances, the alternative would not affect soils. Existing slopes and grades would remain unchanged, except for localized remodeling requirements.

As with each of the alternatives, this plan would permit urban growth and its associated air pollutant levels. However, growth would be somewhat less in this alternative as a result of the odor problems that would continue in the vicinity of the treatment plants. Prevailing winds blow undesirable odors through large residential areas.

The alternative would have an impact on water quality in the immediate vicinity. Water in Fourteen-Mile Slough is currently being degraded by treatment plant discharges. This alternative would perpetuate the discharge of effluent into the slough. Odor problems and a certain degree of degradation of surface and subsurface water would continue.

The biotic community in the slough would continue to be of mediocre quality. Presently, the slough supports a variety of wildlife and certain fish which can survive in low oxygen and turbid situations. No natural vegetation would be disturbed and insect pest populations would continue at their present levels.

Alternative II - North Treatment Plant:

There would be small short- and long-term impact of this alternative on the soils. An interceptor line would have to be constructed to the existing 24-inch interceptor. Some erosion would occur on a short-term basis until annual grasses invaded the bare soil. The soils have already been disturbed, thus making the impact minimal. Upgrading of the North Plant would result in some change in land form due to necessary site fill. The existing land slope would not be changed with the addition of the section of interceptor.

This plan, like the other alternatives, is growth inducing and has potential long-term impact on air quality associated with urban growth. Odor problems would continue as with Alternative I. Construction dust and localized increased pollution caused by traffic congestion around construction sites would be the only short-term impact on air quality.

With Alternative II there would be some impact on water quality in the area. Effluent would be discharged into Fourteen-Mile Slough, as in the previous alternative, and the same problems of odor and water degradation would exist. Effects of Alternative II on wildlife, water plants, and insect pests would be essentially the same as with Alternative I.

Alternative III - North-South Interceptor:

This alternative offers the least detrimental impact on the environment of the three preferred alternatives. Although it also is growth inducing, it provides optimum safeguards for maintenance of water quality and improvement of the biotic community.

The immediate impact of construction would affect the interceptor corridor and water quality in Fourteen-Mile Slough, Calaveras River, and the Stockton Deep Water Shipping Channel.

Construction of the interceptor will cause very little erosion and weathering. It will be built along existing roadways and on the edge of cultivated areas at depths from 3 to 25 feet. The interceptor route will avoid prime agricultural land. Since it will be permanent, however, the interceptor will limit uses of the land immediately above it. Some erosion will probably be experienced along the construction route until vegetation is again stable.

The interceptor will immediately increase downstream flow from the plant due to the consolidation of sewage from the two abandoned plants. This will result in somewhat larger volumes of water treated at the MWQCP and small increases in effluent releases. This could immediately alter aquatic flora and fauna as a result of decreased levels of BOD, COD, suspended solids, oxygen demands, nutrients, total coliform, etc., associated with new tertiary treatment facilities.

The probable long-term effects could bring permanent aquatic changes such as altered numbers of species of fish, insects, and plants brought about by the effect of decreased loading rates on total dissolved oxygen in the water. Blooms of algae and related plants could be decreased somewhat. Eventually, entire species could be displaced by more desirable species. This, however, could not happen unless all effluent sources were subject to the same water quality improvements.

The interceptor would have no influence on groundwater recharge in the area. Recharge is the result of irrigation. There are

no drastic horizontal or vertical groundwater movements within the substrate.

There would be negligible short-term impact on the biotic community. Excavation would temporarily displace some small species, but would not affect larger wildlife varieties. Disturbed vegetation would be replaced with natural annual grasses or weeds. Pest populations would probably not increase at the plant site.

On a long-term basis, Alternative III, as is the case with the other two alternatives, would be conducive to urban growth. This growth, in turn, could tend to displace certain wildlife populations by reducing habitat acreage.

5. SOCIAL IMPACT ANALYSIS

Each of the three alternatives are considered growth inducing and designed to meet the sewage treatment needs of the same type of population growth for the year 1995.

In none of the three alternatives would currently established cultural, historical, religious, or social conditions be altered. Since each viable alternative fits current master plan and zoning frameworks, none would upset trends already foreseen and planned for by local governmental agencies.

Alternative III (the North-South Interceptor) would probably permit smoother, more spontaneous growth patterns than the other two alternatives, however, in Alternatives I and II, odor problems associated with continued operation of North area treatment plants could cause development to take a more erratic direction away from areas where odor was a nuisance. By

permitting growth to take place as governmental planners have deemed appropriate, therefore, Alternative III would have the least social impact of the three alternatives.

6. ANALYSIS OF ADDITIONAL CONSIDERATIONS IN THE SELECTION PROCESS

(a) Analysis of Scarce Resources:

With the exception of productive land, all of the selected alternatives essentially utilize scarce resources to the same degree. Basically, for a given volume of wastewater, the same quantities of power and chemicals will be used whether or not the treatment occurs at one location, or at two or three locations, assuming the same treatment process and the same discharge requirements are used at each location. The treatment process and discharge requirements are the same for each alternative.

Much of the power used at the treatment facilities comes from engine generators fueled with sludge gas with a back-up liquified petroleum gas supply. This accounts for more than one-half of the total power requirements at the plant and is typical for all alternatives. The remaining power requirements are supplied by electrical power sources. Of the three selected alternatives, Alternative III is slightly superior as a result of the higher efficiency of large equipment compared to the efficiency of small equipment. Due to the consolidation of all the sewage at one plant, Alternative III has more uniform wastewater inflow characteristics with smaller differences between peaks and valleys. This, too, results in more efficient use of electrical power. However, differences observed between the three alternatives in terms of their utilization of electrical power, are not believed to be significant with the addition of the new pump station.

The one scarce resource that is not utilized to the same degree in each alternative is productive land. Only Alternative III allows land currently used for wastewater treatment at the North Plant and Lincoln Village Plant sites to be returned to productivity without taking an equal amount of productive land out of service. Sufficient non-productive land already exists at the MWQCP to accomplish Alternative III.

The general availability of the scarce resources needed for each alternative, particularly electrical power and chemicals, has always been good. However, the continuing availability of these resources depends so heavily on the current energy crisis and its solution that predictions of future availableness are not possible to make with any accuracy.

(b) Flexibility and Reliability:

The most recent introduction of new technology in the field of sewage treatment is advanced wastewater treatment, a direct result of the emphasis placed on and the desire for a higher quality effluent. As was true in the past with secondary treatment, capital costs, cost per unit of wastewater treated, and performance have suffered during initial applications of the new process. Lower costs and improved performance come with time. Unit costs resulting from the more efficient treatment of large volumes of wastewater at one location will be lower than can be achieved by treating the same quantity at two or three locations. Alternative III has this advantage over Alternatives I and II.

In the past, the influence of changing living patterns on wastewater treatment facilities has made it necessary to handle larger volumes of wastewater. This trend will probably not continue. As more and more importance is attached to conserving natural

resources, such as potable water, a leveling off in consumption should be reached. If, in fact, this occurs, all of the selected alternatives would have enough site area. However, if the trend of increasing use persists, Alternative III presents the best opportunity to meet these increases. More available land for expansion exists under Alternative III than for the other two alternatives. It would only be necessary to add similar treatment units to handle increased flows.

Modifications due to future changes in water quality criteria can be incorporated at all the sites being considered in the alternatives. More modification is possible under Alternative III because of the great abundance of available space, should a new treatment process at the end of advanced wastewater treatment be required. It is impossible, at the present time, to accurately predict whether the modifications to the advanced wastewater treatment process, for the same changes in critiera, can be accomplished. Technological advances must occur before a higher degree of treatment can be achieved.

Modifications for Treatment, Wastewater Reclamation, and Elimination of Discharge.

As has been previously implied, the proposed facilities in each alternative will provide for the most efficient treatment. The effluent from the advanced wastewater treatment process could be reclaimed for various purposes without modification of the facilities. The possible reclamation uses have been covered earlier in this report. The elimination of direct discharge to surface waters would be a very difficult requirement to meet. None of the sites being considered in the selected alternatives have land area sufficient for either percolation ponds or leach field lines.

The reliability of meeting discharge requirements in all selected alternatives will be very high. All alternatives require the advanced wastewater treatment process to comply with discharge requirements established by the Regional Water Quality Control Board. The "Preliminary Design and Precertification Report for Main Water Quality Control Plant Enlargements and Modifications," indicates that the performance will meet or exceed the State and Federal waste discharge requirements and the objectives of the State basin plan, which recommends that all wastewaters be collected, treated, and discharged locally.

Each of the selected alternatives has storage available in existing oxidation ponds to give protection in the event of hydraulic load fluctuations. The design of the treatment facilities will anticipate all reasonable organic load fluctuations. Probable failure as a result of operator error is believed to be negligible. State requirements concerning qualifications of plant operators would appear to make this mode of failure an unrealistic fear. Failures due to equipment breakdown and power outages will be minimized by incorporating necessary redundancy such as dual pumps and chlorinators and power sources not relying on electricity. All pump stations will be capable of handling anticipated peak flows with the largest pump out of operation and will have standby power available.

The vulnerability of the selected alternatives to natural disasters such as floods and earthquakes can only be addressed in unsure terms. However, maps of flood-prone areas around Metropolitan Stockton, prepared by the United States Department of Interior, indicate the sites considered for all alternatives do not lie within flood-prone areas. The area enjoys a high degree of flood protection. Records show no flooding has occurred in this area for at least 20 years.

(c) Ability to Implement:

The Stockton City Council, with technical support from its Department of Public Works and Planning Department, has pursued a course of responsible planning and implementation of waste collection and treatment facilities for many years. The institutions capable of implementing the proposed project already exists. This is evidenced by the present construction at the MWQCP site, where advanced wastewater treatment facilities are being installed.

The financial picture, regardless of which alternative is considered, is sound. The City has allocated $2.4 million of its $7.6 million bond monies towards trunk sewers. Most of this allocation remains for financing the City's share of any of the selected alternatives.

(d) Compatibility with Local Planning Goals and Objectives:

The planning and objective goals outlined in the introductory chapter of this report can be met by and are compatible with, each of the selected alternatives. The City's concern is to provide the best practical treatment system consistent with discharge requirements for the San Joaquin Delta and for the growth anticipated in the current master plan. All alternatives propose in their scope the use of advanced wastewater treatment and adequate capacity to meet this goal.

The City is also concerned with providing a sewerage plan which will serve the best interests of the public and have the least net impact on the social and physical environment and water quality. The public can best be served by providing necessary and desirable public facilities at reasonable costs. All of the selected alternatives accomplish this goal as well as producing the smallest possible net impact on the environment.

(e) Bypass Analysis:

The potential for bypassing due to mechanical or power failure at any of the pump stations is minimized by providing capacity at each pumping station to carry peak design flow with the largest unit out of service and by providing emergency standby power with gas-powered engine generators.

Each alternative would provide large volumes of storage in the oxidation ponds. As much as 15 days detention during the peak of the canning season (at ultimate development) would be available in Alterative III. Similar detention periods would be available with the other two selected alternatives. Virtually complete protection against discharge of partially treated sewage would be assured. No direct bypass will be provided in any of the proposed improvements. Therefore, no discharge of untreated sewage will reach the San Joaquin River.

Measures are being taken to eliminate inflow sources which would have detrimental effects on the ability of the treatment plants being considered in each alternative to effectively eliminate the bypassing of partially treated sewage. Existing storm drainage systems which are connected to the sanitary sewer collection system will be disconnected from access to the treatment plant. Specifications will provide for adequate infiltration control.

During the entire history of the operations of the existing wastewater treatment plants in Stockton, no prolonged shutdowns have occurred. Nevertheless, if a shutdown did occur, the incoming sewage would receive partial treatment by passing through bar screens, grit chambers, comminuting units, oxidation ponds, and the chlorine contact channel before being discharged. During the canning season, this would constitute poor quality secondary

treatment. However, the good record of plant operation and avoidance of plant shutdown indicates that prolonged plant shutdown is very unlikely.

(f) Flood Protection Analysis:

As previously stated, no flooding has occurred in the areas being considered in each alternative for at least the last 20 years Periodic channel dredging and continuing levee maintenance ensure a high degree of flood protection. None of the alternate plant sites lie within a flood-prone area.

The Map of Flood-Prone Areas, prepared by the United States Department of Interior, shows that the area around the MWQCP has levee protection on the San Joaquin River which limits flooding to a 1-in-60 chance, on the average, during any one year. Past experience indicates that there is about an 80% chance that the levees have been designed with a factor safety of two.

(g) Land Use Analysis:

Existing and projected land use has been presented in Chapter III of this report. Each of the selected alternatives is compatible with regional land use plans. Any changes in land use patterns resulting from the project should be minor in extent. No drastic alterations are foreseen.

7. PUBLIC ACCEPTABILITY

Since no public hearing has been held to discuss the selected alternatives, information pertaining to project acceptability is not available. The anticipated response is a favorable one. During the planning of present construction at the MWQCP, there

were no public detractors. Each of the selected alternatives involves improvements of the same nature. While it is realized that total public acceptability is an unrealistic expectation, general public response should be highly favorable.

Public hearings are scheduled during the early months of 1974 to present and discuss openly and objectively the alternatives of providing sewage service to the North Stockton area. The comments and discussion at these meetings will be summarized and attached as an addendum to this Facility Plan.

VIII. SUMMARY COMPARISON OF PROJECT ALTERNATIVES

A. INTRODUCTION

Discussion has covered the full range of project alternatives from the continued operation of the existing Stockton area treatment plants as they now function, to the complete abandonment of the old system in favor of a new one. A thorough analysis of the requirements, constraints, planning, and overall objectives has been made, revealing that three viable project alternatives exist. Each of the three alternatives would provide the required degree of waste treatment to meet the demands of the projected 1995 population in the North Stockton area.

After a detailed analysis of the environmental, social, and economic considerations of the three alternatives, it appears each one would meet all regulatory requirements applicable to the project. Determining the best alternative, however, demands consideration of which solution would impose the least environmental impact, promise the best overall economic solution, minimize social constraints, and require the fewest tradeoffs between the various benefits and costs associated with project implementation.

B. COMPARISON OF ALTERNATIVES

Although initial screening showed three alternatives capable of withstanding tests for total cost effectiveness, a thorough analysis of cost effectiveness, environmental, economical, and social impacts proves Alternative III, the North-South Interceptor, to be the most efficient and desirable means of providing adequate sewage facilities to the North Stockton service area to meet the demands of population growth in the year 1995 and to fulfill discharge requirements proposed by the regulatory agencies.

Alternative III has been selected after careful study of a number of comparative elements, including monetary considerations, environmental and social impacts, and differential ratings applied to impacts on scarce resources, flexibility and reliability, ability to implement, compatibility with local planning goals and objectives, bypass flood protection, land use analysis and public acceptability. The North-South Interceptor, Alternative III, represents the least overall cost to the public at large, minimizes the long-term environmental impacts, and yields minimal social constraints.

While capital costs for each of the three viable alternatives are nearly identical, the long-term operation and maintenance cost of Alternative III is approximately one-half of the other alternatives. Credit for Alternative III's low O&M cost goes to the fact that capital investments apply to low maintenance systems (pipelines), rather than the high maintenance improvements suggested in Alternatives I and II. Secondly, Alternative III offers the economic advantage of bulk treatment and centralized staff.

Environmental considerations clearly show Alternative III would result in a higher quality effluent discharge into the San Joaquin River via the MWQCP than would be deposited in the river after flowing through Fourteen-Mile Slough under Alternatives I or II. This means Alternative III would bring about less long-term degradation to water, the biotic community, and wildlife habitats.

In terms of social impacts, the three alternatives are essentially the same, with one exception. In Alternative III, population centers would be upwind from potential odors created at the MWQCP, while Alternatives I and II would continue the operation of waste treatment facilities up wind of the northern populated areas.

The implementation of any one of the alternatives is feasible. All are compatible with local planning goals and objectives. Potential flood damage is minimal, regardless of which alternative is selected.

Alternative III permits the most efficient use of resources and provides the greatest flexibility and reliability by consolidating processes and minimizing the impact of a malfunction in any single unit. Alternative I removes the necessity of obtaining interagency agreement between the City of Stockton and San Joaquin County. Such agreements would be necessary in order to consolidate facilities, as proposed in Alternatives II and III.

The ability to prevent bypass of the entire plant is, of course, diminished in a larger plant, like that proposed in Alternative I. The bypass of any single element or piece of equipment is also diminished in a large plant where parallel facilities are provided.

There is no substantial difference between the three alternatives in terms of compatibility with land use. However, the location of treatment plants in Alternatives I and II is upwind of planned residential developments.

Table VIII-1 is an evaluation of the tangible and intangible elements of the alternatives. In order to rank the importance of comparative factors, relative weights have been assigned to each variable. Each alternative is then rated with a number representing its share of the total relative weight assigned to each variable.

As can be seen in nearly every case, Alternative III emerges superior to the other two alternatives. We, therefore, recommend

that the North-South Interceptor be constructed to consolidate treatment of the North Stockton service area at the MWQCP on the grounds that it is the most overall cost-effective means of providing sewage treatment to the area.

Table VIII-1
COMPARISON ALTERNATIVES

Factors	Relative Weight	Alternatives I	II	III
1. Cost Effectiveness Analysis (Section VII, D 5)				
A. Monetary Cost Analysis (Section VII, D 6)	10	2	5	9
B. Environmental Impact Analysis (Section VII, D 7)	10	7	7	9
C. Social Impact Analysis (Section VII, D 8)	10	5	5	9
2. Additional Considerations				
A. Analysis of Scarce Resources (Section VII, D 9a)	2	1	1	2
B. Flexibility and Reliability (Section VII, D 9b)	5	1	2	5
C. Ability to Implement (Section VII, D 9c)	2	2	2	2
D. Compatibility with Local Planning (Section VII, D 9d)	5	4	4	5
E. Bypass Analysis (Section VII, D 9e)	2	0	0	0
F. Flood Protection Analysis (Section VII, D 8f)	2	2	2	2
G. Land Use Analysis (Section VII, D 8g)	10	2	5	8
3. Public Acceptability (Section VII, D 10)	10	8	2	5

IX. APPARENT BEST ALTERNATIVE PROJECT

A. INTRODUCTION

Based upon a thorough analysis of cost effectiveness, including economic, environmental, and social considerations, Alternative III, the North-South Interceptor, is proposed as the best alternative. The proposed project, Alternative III, meets the goals of the City of Stockton, the regional sewage authority, in providing sewage service for the North Stockton area within the identified constraints of environmental, social, and water quality objectives. The project will provide sewage service for approximately 109,000 people north of Calaveras River, and an additional 45,000 in the Smith's Canal service area south of the river.

B. PROJECT DESCRIPTION

The North-South Interceptor will intercept the sewage flow now being treated at Lincoln Village and the North Treatment Plant and convey it to the MWQCP, as shown on the project map. The interceptor will be designed with sufficient capacity to provide sewage service for the 1995 estimated population in the North Stockton service area. The two existing North area plants will be abandoned.

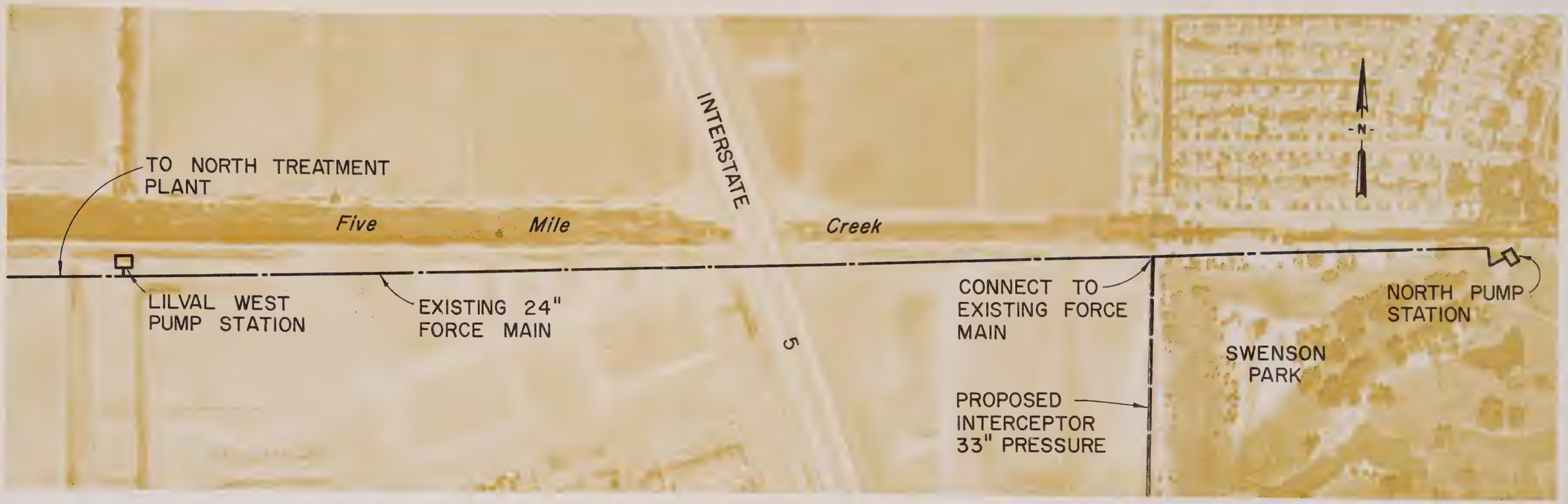
The interceptor will be comprised of force mains, gravity pipelines, and a major pump station, as shown on the following maps. The new interceptor will be connected to the existing 24-inch force main between the Lilval West and North Pump Stations near Five-Mile Creek. This connection will allow the continued use of the existing pump stations. Flow will be reversed in the existing force main from the Lilval West Pump

Station to the point of connection. Improvements at the existing stations will include the addition of the pumps to provide for the design capacity as well as the necessary controls, recorders, auxiliary power equipment, and odor control equipment. Space was provided for this in each station at the time of construction.

The interceptor will be a 33-inch pressure force main from Five-Mile Creek to just north of the Calaveras River, with a capacity of 18.4 mgd.

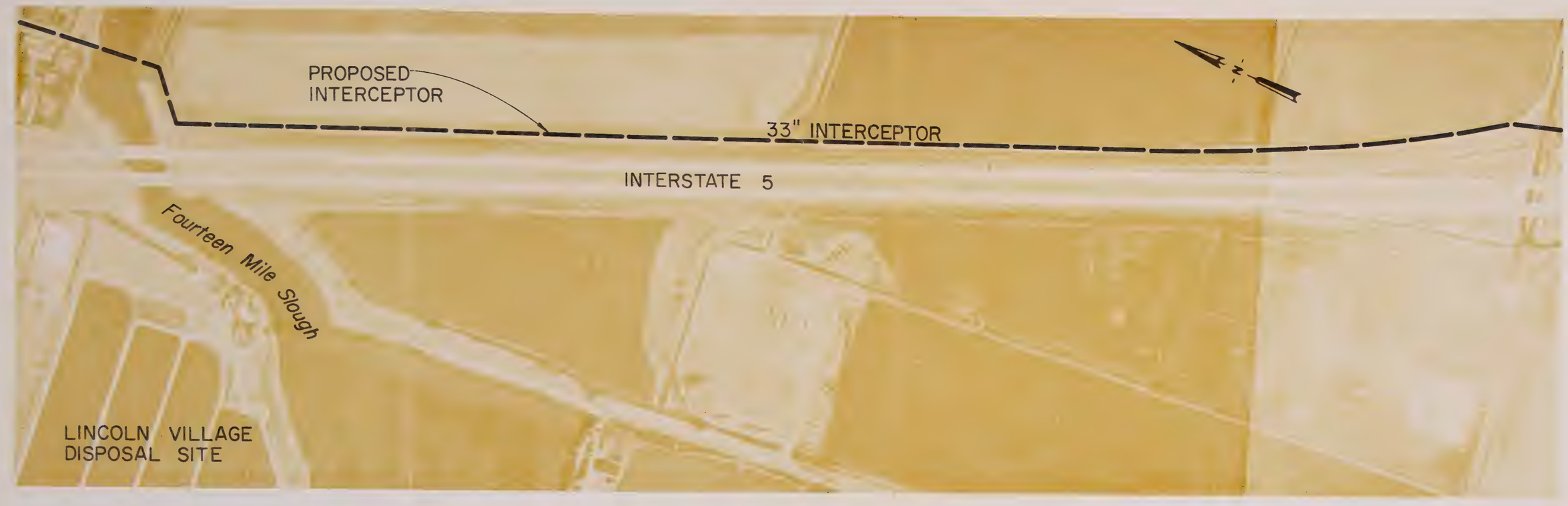
The gravity portion of the interceptor will be a 42-inch pipe on minimal slopes with a 20.7-mgd capacity from north of the Calaveras River to the Smith's Canal Pump Station located at the Old Smith's Canal Sewage Plant. The new parallel 30-inch discharge force main from the Smith's Canal Pump Station will have a 14.5-mgd capacity and will be located in existing streets southward across the Stockton Deep Water Channel at the west end of the port facility to Navy Drive. At Navy Drive, the force main discharges into a 36-inch gravity interceptor down Navy Drive to the inlet works at the MWQCP.

The conversion of the sewage flowing through the North Plant is accomplished by connecting the force main between the two existing pump stations. The County's Lincoln Village disposal plant is serving three separate areas and each is connected to the new interceptor at different locations. The Colonial Heights sewage will flow by gravity into the sewer system tributary to the North Pump Station, which will pump the sewage into the interceptor. The Lincoln Village sewage will flow by gravity into the Lilval West Pump Station service area and pump into the interceptor. The Pacific Gardens sewage will discharge into the interceptor via its existing pump station and new force main near the Calaveras River.



CITY OF STOCKTON
NORTH-SOUTH INTERCEPTOR
APPROXIMATE SCALE 1"=400'

PLATE 1



CITY OF STOCKTON
NORTH-SOUTH INTERCEPTOR
APPROXIMATE SCALE 1"=400'

PLATE 2

CITY OF STOCKTON
NORTH-SOUTH INTERCEPTOR
APPROXIMATE SCALE 1"=400'

PLATE 3

CITY OF STOCKTON
NORTH-SOUTH INTERCEPTOR
APPROXIMATE SCALE 1"=400'

PLATE 4

A new 29-mgd pump station will be constructed at the existing Smith's Canal site. This pump station will provide capacity for the North service area and the domestic flow from the existing Smith's Canal service area. The station will include chlorination and air scrubbers for odor control, and its capacity will be based on one pump in reserve. This pump station will make use of the existing Smith's Canal 30-inch force main. The new force main will have a more direct routing to the MWQCP, but will be hydraulically parallel to the existing force main. The dual force mains will provide backup system for maintenance on the lines under the Stockton Deep Water Channel. As previously outlined, the proposed project is the most cost-effective interceptor project.

The proposed project also includes the cost-effective storm flow repairs outlined in Section IV. The cost-effective inflow-infiltration reduction plan is shown on Map IV-1, Inflow Reduction Plan. This proposed plan would require the construction of storm sewers and the connection of these sewers to storm catch basins. This new system would eliminate storm flow from the sanitary sewer system.

C. ESTIMATED PROJECT COST

The estimated project costs, based on expected 1974 construction prices, are tabulated in Table IX-1. Total estimated project cost is $6 million. This includes the cost of providing sewage service to the 154,000 people expected to populate the service area in 1995, cost-effective inflow improvements, 10% construction contingencies, and approximately 15% for engineering, administrative, and technical services.

Table IX-1

NORTH STOCKTON WASTEWATER

FACILITY PLAN

NORTH-SOUTH INTERCEPTOR

PROJECT COST ESTIMATE

	Applicant's Estimate of Total Project Cost	Applicant's Estimate of Cost Eligible For Grant Participation	Percent
Construction			
New Smith's Canal Pump Station	$ 988,000	$ 988,000	16.5
Force Main 33" - 12,000'	617,000	617,000	10.2
Gravity Interceptor 42" - 9,000'	783,000	783,000	13.1
Force Main 30" - 8,500'	403,000	403,000	6.7
Gravity Interceptor 36" - 3,500'	166,000	166,000	2.8
Submarine Crossings	237,000	237,000	3.9
Deep Water Channel Crossing	474,000	474,000	7.9
Bore and Jack	63,000	63,000	1.1
Pavement & Utilities	328,000	328,000	5.5
Modifications to North Pump Station	142,000	142,000	2.4
Modifications to Lilval West Pump Station	67,000	67,000	1.1
Inflow Reduction Improvements	475,000	475,000	7.9
Sub Total	4,743,000	4,743,000	79.1
Technical Services	723,000	723,000	12.0
Legal and Fiscal	30,000	30,000	0.5
Administrative	30,000	30,000	0.5
Contingency 10%	474,000	474,000	7.9
TOTAL	$6,000,000	$6,000,000	100%

It is interesting to note that a 25% change in project construction costs is approximately a 10% change in the estimated present worth value of the interceptor alternative.

D. SUMMARY OF ALTERNATIVE ANALYSIS OF BEST APPARENT PROJECT

From a list of project alternatives, early analysis pointed to three primary alternatives. These three alternatives were then subjected to closer analysis in order to find the single alternative that would impose the least environmental impact and yield the greatest benefit.

Analysis proves Alternative III, the North-South Interceptor, represents the least cost to the public, minimizes long-term environmental impact, and yields minimal social constraints. While capital costs are the same for all three alternatives, Alternative III demands only one-half the operation and maintenance expense of the other two.

Effluent discharge into receiving waters would be far less with Alternative III than with Alternatives I and II. Alternative III also offers the most efficient use of resources and the greatest flexibility and reliability.

All three alternatives are compatible with local planning goals, but Alternatives I and II would continue operation of plants upwind from residential developments.

Construction of a North-South Interceptor and consolidation of treatment at the MWQCP is recommended as the most cost-effective means of providing sewage treatment to the area.

E. IMPLEMENTATION SCHEDULE AND INSTITUTIONS

The proposed project will be constructed and the local share financed initially by the City of Stockton, which has been designated as a regional sewage authority. The implementation schedule anticipates completion of construction in 1976. The proposed project provides capacity to serve the entire North Stockton area. This includes the area presently within the City limits, areas currently being served by the County's Lincoln Village Plant, and areas earmarked for future development, both inside and outside the City limits. The area inside the City limits, and that currently being served by the City, are already included in the City's plans. The areas outside the City limits not now receiving City sewage service will be added to the City system automatically, since the only designated regional plant is the MWQCP. The areas now being served by the County's Lincoln Village Plant must either negotiate a contract for sewage export and treatment service with the City, or be annexed to the City. With annexation, they would automatically become a part of the City's service area. The City of Stockton, as a regional sewage service authority, has agreed previously to provide service to the County's area, either through annexation or contract arrangement. However, it is important to note that a contractural arrangement or annexation does not affect the financing or timing of the project.

F. OPERATION AND MAINTENANCE PROGRAM

The operation and maintenance of the North-South Interceptor and pump stations will be merged into the City's current operation and maintenance programs. As previously outlined, the City has a very efficient, comprehensive O&M procedure for all pipelines, mechanical equipment, and structures. These procedures have been developed through years of experience and

are, in all cases, equivalent or in excess of the requirements set forth by the O&M manual's guidelines, the Division of Water Quality, and the EPA requirements. During the design phase of the project, a preliminary O&M manual will be prepared and finalized after the initial project startup.

Interceptor operating costs for the first years are estimated at $34,000 annually, increasing to $40,000 annually by the fifth year. Costs of operation and maintenance at the MWQCP, including bond retirement, are estimated at approximately $300 per million gallons.

G. FINANCIAL PLAN

Estimated project cost of the North-South Interceptor is $6 million. The financial plan considers 87-1/2% of the $6 million to be funded by State Clean Water and EPA funds, with the remaining 12-1/2% to be funded from local sources, as outlined in the following table:

Funding Source		Amount
EPA	75%	$4,500,000
State Clean Water	12-1/2%	750,000
City of Stockton	12-1/2%	750,000
Total	100%	$6,000,000

The City of Stockton $7.6 million bond issue was passed in 1970. Of this initial bond issue, $2-1/2 million has been set aside for construction, financing, and progress payments for the proposed project. The financing and proposed schedule is included in the financial plan and revenue program prepared for the tertiary addition to the MWQCP

H. REVENUE PROGRAM

The construction of the proposed North-South Interceptor is concurrent with additions at the MWQCP. Consequently, the financial plan and revenue program for the proposed project is included with the plan and program prepared for the MWQCP tertiary additions.

The North Stockton area has no substantial industrial flow requiring repayment or special use charges. The City's intent is that all users within the service area be charged equitably without consideration of their proximity to the treatment facility.

REFERENCES

Comprehensive Plan for Water System Development in North Stockton Area, May 1973

For: City of Stockton

By: James M. Montgomery, Consulting Engineer

Infiltration-Inflow Analysis, November 1973

For: City of Stockton

By: Brown & Caldwell, Consulting Engineers

Stockton Sewage Survey, 1964-65

For: City of Stockton

By: Brown & Caldwell, Consulting Engineers

Main Water Quality Control Plant, 1969 Enlargement and Modification Study, May 1969

For: City of Stockton

By: Brown & Caldwell, Consulting Engineers

Pilot Trickling Filter Studies at the Main Water Quality Control Plant, March 1973

For: City of Stockton

By: Brown & Caldwell, Consulting Engineers

Removal of Nitrate by an Algal System, Phase II, June 1971

By: California Department of Water Resources

Removal of Nitrate by an Algal System, April 1971

By: California Department of Water Resources

APPENDIX A

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = POPULATION Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
Lilval West						
C.T. 31.02		1,584				
T.Z. 01	25		1,039			3,437
T.Z. 10 (97%)	454		3,000			3,730
TOTAL	479	1,584	4,039	5,380	6,900	7,167
Lilval East						
C.T. 31.02						
T.Z. 02*	0	0	0			680
*80% T.Z. is Golf Course						
TOTAL	0	0	0	275	640	680
Lincoln Village						
C.T. 31.02		5,500				
T.Z. 03 (10%)	84		84			84
T.Z. 04	670		670			670
T.Z. 05	866		905			1,036
T.Z. 08 (80%)	1,828		1,886			1,974
T.Z. 09	1,956		1,956			2,186
T.Z. 10 (3%)	14		74			115
TOTAL	5,418	5,500	5,575	5,600	5,800	6,065
Colonial Heights						
C.T. 32.02		1,700				
T.Z. 15	994		994			994
T.Z. 16 (60%)	553		871			1,183
TOTAL	1,547	1,700	1,865	2,030	2,130	2,177

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
North Pump Station						
C.T. 30		9				
T. Z. 01	677		0			0
C.T. 31.01		100				
T.Z. 03	0		0			1,889
T.Z. 04	0		0			0
T.Z. 08 (10%)	85		120			261
C.T. 31.02		2,200				
T.Z. 03 (90%)	760		760			760
T.Z. 06	339		619			619
T.Z. 07	232		369			369
T.Z. 08 (20%)	457		493			493
C.T. 32.01		4,489				
T.Z. 02	14		14			3,099
T.Z. 03	67		67			2,651
T.Z. 04	2,409		2,598			2,598
T.Z. 05	1,337		1,337			1,337
T.Z. 06	447		555			555
C.T. 32.02		1,491				
T.Z. 01	0		0			0
T.Z. 02	27		27			27
T.Z. 03	41		41			41
T.Z. 04	0		0			0
T.Z. 05	3		3			1,965
T.Z. 06	204		204			2,394
T.Z. 07	0		0			0
T.Z. 09	0		0			0

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	POPULATION Design Population = Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
T.Z. 04	1,418		1,426			1,845
T.Z. 05	468		1,653			3,042
C.T. 34		1,475				
T.Z. 01	22		22			22
T.Z. 02	54		54			54
T.Z. 03	40		40			40
T.Z. 04	12		12			12
T.Z. 05	334		334			334
T.Z. 06	0		0			0
T.Z. 07	5		5			5
T.Z. 08	5		5			1,542
T.Z. 09	3		3			1,099
T.Z. 10	0		0			1,345
T.Z. 11	9		9			2,000
T.Z. 12	8		8			8
T.Z. 13	197		197			197
T.Z. 14	3		3			1,768
T.Z. 15	3		1,177			3,079
T.Z. 16	39		39			1,892
T.Z. 17	8		8			1,918
T.Z. 18	83		83			83
T.Z. 19	0		0			1,760
T.Z. 20	0		0			0
T.Z. 21	11		11			299
T.Z. 22	91		91			741
T.Z. 23	37		37			37
C.T. 35		3,819				

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
T.Z. 10	6		6			6
T.Z. 11	291		291			291
T.Z. 12	125		125			125
T.Z. 13	0		257			2,142
T.Z. 14	171		507			507
T.Z. 16 (40%)	369		581			789
C.T. 3301		7,859				
T.Z. 01	1,322		1,322			1,340
T.Z. 02	1,421		1,500			1,583
T.Z. 03	1,267		1,738			1,746
T.Z. 04	232		266			688
T.Z. 05	0		0			0
T.Z. 06	0		0			0
T.Z. 07	0		0			0
T.Z. 08	1,137		1,182			1,745
T.Z. 09	1,634		1,972			2,167
T.Z. 10	0		440			1,994
C.T. 33.02		6,320				
T.Z. 01	1,253		1,839			2,051
T.Z. 02	1,087		2,224			2,314
T.Z. 03	1,326		1,520			1,704
T.Z. 04	888		950			1,014
T.Z. 05	857		880			905
C.T. 33.03		5,238				
T.Z. 01	10		10			660
T.Z. 02	730		1,508			1,702
T.Z. 03	1,472		1,571			1,735

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
T.Z. 01	967		967			1,881
T.Z. 02	255		255			430
T.Z. 03	46		46			46
T.Z. 04	67		67			67
T.Z. 05	108		108			178
T.Z. 06	175		175			350
T.Z. 07	994		994			1,519
T.Z. 08	880		880			1,055
T.Z. 09	53		53			228
T.Z. 10	41		41			41
T.Z. 11	13		13			538
North Pump Station Area						
TOTAL	29,146	33,000	36,712	41,000	56,200	75,721
State Hospital						
C.T. 31.01		1,194				
T.Z. 01	32		32			32
T.Z. 02	0		0			1,904
T.Z. 05	0		0			2,314
T.Z. 06	10		10			1,368
T.Z. 07	318		377			1,544
T.Z. 08 (90%)	763		1,081			2,351
TOTAL	1,123	1,194	1,500	1,820	4,000	9,513
Pacific Gardens						
C.T. 10		4,020				
T.Z. 01	298		333			333

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = Eligible Population 1967 [1]	1970 Census [1]	POPULATION Capacity 1972 [1]	1975 [1]	1985 [2]	1995 [1]
T.Z. 02 (50%)	0		0			0
T.Z. 03	2,057		2,062			2,123
T.Z. 04	1,659		1,659			1,659
C.T. 11.01		3,350				
T.Z. 01 (85%)	1,599		1,639			1,651
T.Z. 03	1,731		1,731			1,731
C.T. 11.02		528				
T.Z. 01 (60%)	443		443			443
T.Z. 02 (10%)	85		85			85
TOTAL	7,872	7,898	7,952	8,000	8,010	8,025
Smith's Canal						
C.T. 01		456				
T.Z. 01 (40%)	65		65			86
T.Z. 02 (20%)	148		148			148
T.Z. 03 (20%)	189		189			172
C.T. 03		1,141				
T.Z. 01	558		692			738
T.Z. 02	558		732			848
C.T. 04		6,895				
T.Z. 01	1,190		1,190			1,190
T.Z. 02	866		866			866
T.Z. 03	1,088		1,404			1,404
T.Z. 04	887		1,203			1,203
T.Z. 05	688		1,004			1,004
T.Z. 06	756		1,072			1,072
T.Z. 07	764		1,040			1,080

[1] Data Supplied by City of Stockton

[2] Data Taken From Graph of Population Projections

Appendix A

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = 1967 [1]	1970 Census	POPULATION Eligible 1972 [1]	Capacity 1975 [1]	Capacity 1985 [2]	Population 1995 [1]
T.Z. 01	1,639		1,639			1,639
T.Z. 02	1,388		1,388			1,388
T.Z. 03	789		789			789
T.Z. 04	1,101		1,101			1,101
T.Z. 05	1,201		1,201			1,201
C.T. 13		5,392				
T.Z. 01	1,088		1,088			1,088
T.Z. 02	1,259		1,259			1,259
T.Z. 03	553		553			342
T.Z. 04	1,361		1,422			1,422
T.Z. 05	773		865			865
C.T. 14		4,832				
T.Z. 01	1,859		1,859			1,859
T.Z. 02	1,198		1,288			1,288
T.Z. 03	488		669			1,020
T.Z. 04	1,030		796			1,413
C.T. 15		175				
T.Z. 05 (5%)	29		29			29
T.Z. 06 (20%)	165		165			165
C.T. 29		1,467				
T.Z. 01	1,684		1,684			1,684
Smith's Canal Area						
TOTAL	39,490	41,027	42,690	43,000	44,000	44,766
TOTAL SERVICE AREA	85,075	91,903	100,333		127,680	
				107,105		154,114

[1] Data Supplied by City of Stockton

[2] Data Taken From Graph of Population Projections

NORTH STOCKTON POPULATION BY SERVICE AREAS

Census Tract & Traffic Zone	Design Population = Eligible Capacity Population					
	1 1967	1970 Census	1 1972	1 1975	2 1985	1 1995
T.Z. 08	821		821			821
C.T. 05		1,533				
T.Z. 01	1,186		1,186			1,186
T.Z. 02 (30%)	333		357			388
C.T. 09		5,284				
T.Z. 01	8		8			8
T.Z. 02	234		863			1,015
T.Z. 03	1,070		1,065			1,136
T.Z. 04	1,019		1,019			1,019
T.Z. 05	858		858			858
T.Z. 06	917		917			917
T.Z. 07	58		58			58
T.Z. 08	351		351			351
C.T. 10		1,197				
T.Z. 02 (50%)	0		0			0
T.Z. 05	870		980			1,024
T.Z. 06	288		424			641
C.T. 11.01		2,083				
T.Z. 01 (15%)	282		291			291
T.Z. 02	1,802		1,941			2,504
C.T. 11.02		4,046				
T.Z. 01 (40%)	296		296			296
T.Z. 02 (90%)	769		769			769
T.Z. 03	1,287		1,287			1,287
T.Z. 04	1,116		1,116			1,116
T.Z. 05	563		683			718
C.T. 12		6,526				

[1]Data Supplied by City of Stockton

[2]Data Taken From Graph of Population Projections

NORTH STOCKTON SERVICE AREA
1970 CENSUS SUMMARY

	Census Tract	1970 Census	% in Area	1970 Service Area Population	1995 Projected Service Area Population
North of	30.00	9	100	9	
Calaveras	31.01	1,294	100	1,294	
River	31.02	9,284	100	9,284	
	32.01	4,489	100	4,489	
	32.02	3,191	100	3,191	
	33.01	7,859	100	7,859	
	33.02	6,320	100	6,320	
	33.03	5,238	100	5,238	
	34.00	1,475	100	1,475	
	35.00	3,819	100	3,819	
Sub Total				42,978	101,323
South of	01.00	5,696	8	456	
Calaveras	03.00	1,141	100	1,141	
River	04.00	6,895	100	6,895	
	05.00	2,555	60	1,533	
	09.00	5,284	100	5,284	
	10.00	5,217	100	5,217	
	11.01	5,433	100	5,433	
	11.02	4,574	100	4,574	
	12.00	6,526	100	6,526	
	13.00	5,392	100	5,392	
	14.00	4,832	100	4,832	
	15.00	5,831	3	175	
	29.00	1,467	100	1,467	
Sub Total				48,925	52,791
TOTAL NORTH STOCKTON SERVICE AREA				91,903	154,114

Table III-1

CLIMATOLOGICAL DATA FOR STOCKTON

MONTH	AIR TEMPERATURE, °F						PRECIPITATION, INCHES						EVAPORATION INCHES	
	LONG TERM AVG.	YEAR, 1972 AVERAGE			YEAR, 1972 EXTREMES		LONG TERM AVG.	YEAR, 1972						
		AVG.	MAX.	MIN.	HIGH	LOW		TOTAL	MAX. DAY	NO. DAYS EXCEEDING 0.1"	0.5"	1.0"	1971	1972
Jan.	44.7	40.7	49.3	32.1	58	23	2.79	0.28	0.27	1	0	0	1.14	0.90
Feb.	48.9	50.0	61.6	38.3	74	22	2.63	0.68	0.56	2	1	0	2.01	1.97
Mar.	53.2	58.3	73.1	43.5	86	33	2.15	0.03	0.02	0	0	0	4.93	5.26
Apr.	58.6	58.2	72.3	44.1	90	36	1.26	0.86	0.21	5	0	0	6.14	6.85
May	64.1	65.9	82.6	49.2	99	40	0.56	0.09	0.09	0	0	0	7.57	10.09
June	70.0	71.0	88.5	53.4	102	42	0.09	0.17	0.17	1	0	0	9.94	10.93
July	74.5	74.2	92.0	56.4	112	48	0.01	0.00	0.00	0	0	0	12.32	11.45
Aug.	72.6	75.5	92.0	58.9	101	52	0.00	0.00	0.00	0	0	0	11.88	11.24
Sept.	69.8	69.0	84.4	53.5	99	41	0.18	0.82	0.70	2	1	0	8.27	7.80
Oct.	62.2	61.8	74.1	49.5	89	33	0.62	1.21	0.53	5	1	0	4.99	4.08
Nov.	52.1	50.2	58.8	41.5	71	35	1.23	4.49	1.35	7	4	1	2.32	1.98
Dec.	45.8	41.1	48.6	33.6	64	20	2.79	1.79	0.58	4	2	0	1.66	0.87
Year	59.7	59.6	73.1	46.2	112	20	14.31	10.42	3.85	27	9	1	73.17	73.42

Source of data; U. S. Weather Bureau, "Climatological Data, California," January-December 1972 issues and 1972 Annual Summary

Temperature and precipiation data recorded at station located at Stockton Fire Station No. 4.

Evaporation data recorded at station located at Manteca.

Long-term averages based on period 1931-1960.

SERVICE AREA BOUNDARY

C.T. 32.02

C.T. 32.01

C.T. 33.03

C.T. 34

C.T. 35

C.T. 33.02

C.T. 31.02

C.T. 33.01

C.T. 30

C.T. 31.01

C.T. 14

C.T. 15

C.T. 11.01

C.T. 12

C.T. 13

C.T. 11.02

C.T. 10

C.T. 4

C.T. 29

C.T. 5

C.T. 9

C.T. 3

INTERSTATE 5

HIGHWAY 99

HAMMER LANE

HOLT

DR. PACIFIC

BENJAMIN

LANE

MARCH

PERSHING

CALAVERAS

RIVER

AVENUE

AVENUE

SAN JOAQUIN

RIVER

PORT OF STOCKTON

SERVICE AREA BOUNDARY

N

0 1 MILE

LEGEND

CENSUS TRACT NO. — 42.03

TRAFFIC ZONE NO. — 02

C. T. BOUNDARY —

T. Z. BOUNDARY —

MAP III-4
NORTH STOCKTON WASTEWATER
FACILITY PLAN
SERVICE AREA BOUNDARIES
AND
CENSUS TRACTS & TRAFFIC ZONES

CH2M HILL

APPENDIX B

Table IV-1
NORTH STOCKTON WASTEWATER FACILITY PLAN
SUMMARY OF MONTHLY TREATMENT PLANT OPERATIONAL DATA

LINCOLN VILLAGE TREATMENT PLANT	1972 July	Aug.	Sept	Oct.	Nov.	Dec.	1973 Jan.	Feb.	Mar.	Apr.	May	June
Avg Flow mgd	1.5	1.3	1.5	1.4	1.3	1.2	1.4	1.9	2.0	2.0	1.9	1.8
BOD mg/l Infl.	143	184	121	147	172	141	113	115	139	126	183	169
Effl.	13	12	4	18	11	13	11	7	6	6	10	9
S.S. mg/l Infl.	160	127	-	-	-	-	-	-	-	-	-	100
Effl.	60	20	60	20	20	20	80	40	20	60	40	40
Chlorine Residual (ppm)	0.1	0.1	0.8	4.1	1.5	0.6	0.3	0.4	0.3	0.7	0.7	1.0

NORTH TREATMENT PLANT	Jan.	Feb.	Mar.	Apr.	1972 May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Avg Flow mgd	2.8	2.2	2.0	1.9	2.1	2.2	2.1	2.0	2.1	2.2	2.3	2.3
Peak Flow mgd	4.5	4.0	3.7	3.7	3.5	3.9	4.0	4.4	4.7	3.8	4.5	4.1
BOD mg/l Infl.	245	230	253	242	260	265	260	228	242	220	230	225
Effl.	31	36	44	19	31	24	17	24	36	32	37	38
S.S. mg/l Infl.	210	205	225	218	254	242	258	234	212	228	215	187
Effl.	27	45	79	38	94	69	101	102	131	66	98	52

MAIN WATER QUALITY CONTROL PLANT	Jan.	Feb.	Mar.	Apr.	1972	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Avg Flow mgd	12.3	13.3	16.4	17.6	20.0	19.9	27.8	36.3	32.1	18.2	15.0	14.1
Peak Flow mgd	24.5	22.5	29.0	27.0	26.0	29.0	43.5	43.0	44.5	34.5	40.0	20.5
BOD mg/l Infl.	239	250	256	208	193	241	331	469	353	289	232	242
Effl.	22	25	4	5	11	4	34	37	29	18	15	23
S.S. mg/l Infl.	213	224	228	179	176	209	281	367	355	273	202	201
Effl.	31	61	20	11	24	51	105	125	84	59	50	39

Table V-2

DESIGN DATA AND LOADINGS,

EXISTING NORTH PLANT

Item	Value
Basic Data	
Design Population	40,000
Design Flow	3.5 mgd
BOD Loading	8,000 lbs/day
Screening	
Type	Barminutor
Number Machines	1
Hydraulic Capacity	7.5 mgd
Primary Sedimentation	
Number Basins	1
Overflow Rate @ Design Flow	700 gpd/sq ft
Detention Time @ Design Flow	2.5 hours
Effluent Weir Rate	14,000 gpd/ft
Stabilization Ponds	
Area	71 acres
Depth	4.5 ft
Detention Period	30 days
BOD Loading	73 lbs/ac/day
Digestion Tanks	
Number	1
Total Volume	26,000 cubic ft
Unit Solids Loading	0.2 lbs/ac-ft/day
Digested Sludge Lagoons	
Number	2
Total Volume	630,000 cubic ft

Table V-3

DESIGN DATA AND LOADINGS,

EXISTING LINCOLN VILLAGE PLANT

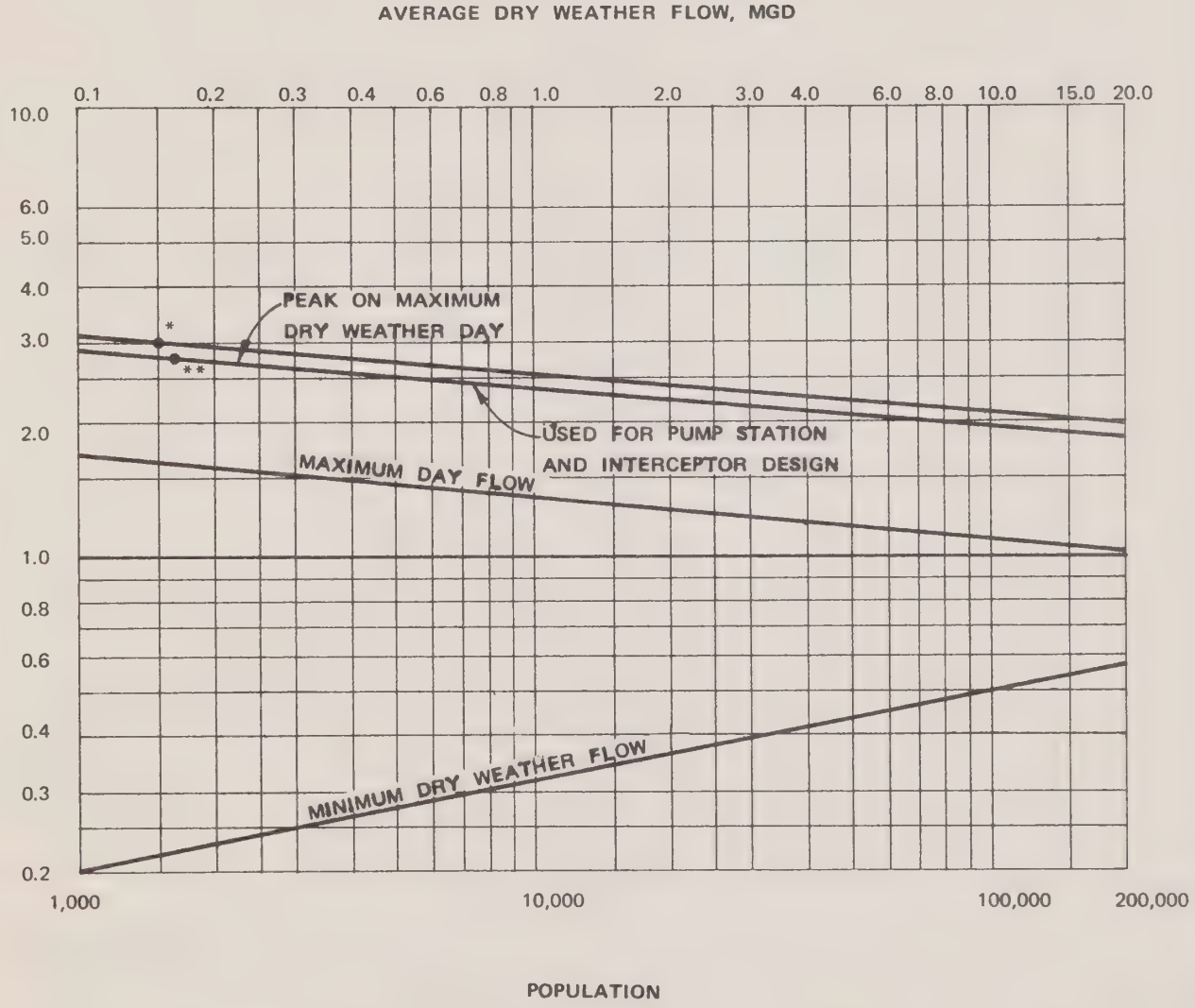
Basic Data	
Design Population	16,000
Design Flow	1.7 mgd
BOD Loading	2,000 lbs/day
Aeration Basin	
Type	Completely Mixed
Number	1
Size	70 x 170
BOD (applied)	2,000 lbs/day
Aerators	3 - 20 hp
Secondary Sedimentation	
Number of Basins	1
Size (diameter)	50 ft
Stabilization Ponds	
Area	70 acres
Volume	315 ac-ft
Detention Period	57 days

Table V-4

BASIC DESIGN DATA AND LOADINGS FOR
THE MAIN WATER QUALITY CONTROL PLANT

Item	Value	
	Canning Season	Non-Canning Season
Basic Data		
Population	138,000	
Sewage Flow Avg	58 mgd	23 mgd
Sewage Flow Peak	75 mgd	60 mgd
5-day BOD Concentration	610 mg/l	280 mg/l
5-day BOD Load	236,000 lbs/day	54,000 lbs/day
Suspended Solids Concentration	410 mg/l	160 mg/l
Suspended Solids Load	167,000 lbs/day	31,000 lbs/day
Grit Channels		
Number	6	
Width	4.0 ft	
Depth	5.4 ft	
Maximum Forward Velocity	1.4 fps	
Comminuting Units		
Number	4	
Channel Depth	4.8 ft	
Hydraulic Capacity (all units)	120 mgd	
Primary Treatment		
Rectangular Tanks		
Number	4	
Length	141 ft	
Width	37 ft	
Volume (each)	0.59 mg	
Surface Area (each)	5,200 psf	

APPENDIX C



*PEAK ON MAXIMUM DAY DEVELOPED FOR SUBREGIONAL STUDY AT CITY OF FAIRFIELD BY JAMES M. MONTGOMERY, CONSULTING ENGINEERS.

**PEAK ON MAXIMUM DAY, CITY OF LOS ANGELES.

RATIO OF EXTREME FLOWS TO AVERAGE DRY WEATHER FLOWS

CH2M HILL

NORTH STOCKTON SERVICE AREA
DESIGN POPULATION AND FLOWS

Area	1995 Population	Average Dry Weather Flow (mgd)	Peak Dry Weather Flow (mgd)
ALTERNATIVE #1			
Colonial Heights	2,177	.22	.6
North Pump Station	75,721	7.57	15.1
Total North Pump Station	77,898	7.79	15.6
Lincoln Village	6,065	.61	1.5
Lilval West	7,167	.72	1.8
Total Lilval West Pump Station	13,232	1.33	3.0
Lilval East	680	.07	.2
Sub Total	91,810	9.2	18.4
State Hospital	9,513	.95	2.3
Sub Total	101,323	10.1	19.2
Pacific Gardens	8,025	.80	2.0
Sub Total	109,348	10.9	20.7
Smith's Canal	44,766	4.48	9.4
TOTAL	154,114	15.4	29
ALTERNATIVES #2 & #3			
Lilval West	7,167	0.72	1.8
Lilval East	680	0.07	.2
North Pump Station	75,721	7.57	15.1
State Hospital	9,513	.95	2.3
Sub Total North PS	93,081	9.31	18.1
Colonial Heights	2,177	0.22	.6
Lincoln Village	6,065	.61	1.5
Pacific Gardens	8,025	.80	2.0
Sub Total Lincoln Village PS	16,267	1.63	3.7
TOTAL	109,348	10.9	20.7

Alum	250 mg/l
Sulphuric Acid	3.0 meq/l
Polyelectrolyte	2.0 mg/l
Chlorine	
Prechlorination	8,000 lbs/day
Filter Influent	8,000 lbs/day
Disinfection	2,300 lbs/day
Ammonia Removal	48,000 lbs/day
Sulfur Dioxide (Dechlorination)	3,800 lbs/day
Flotation Tanks	
Number	4
Diameter	85 ft
Solids Loading Rate	5.1 lbs/sq ft/day
Filters	
Number	4
Filtration Rate	5.7 gpm/sq ft
Type	3 media

- Organic Loading
  - Canning Season
  - Non-Canning Season
- Secondary Clarifiers
  - Number: 4
  - Diameter: 100
  - Volume (each): 0.71 mg
  - Detention Time
    - Non-Canning Season: 2.9 hrs
    - Canning Season: 1.2 hrs
  - Overflow Rate
    - Non-Canning Season: 700 gal/sf/day
    - Canning Season: 1,800 gal/sf/day
- Stabilization Ponds
  - Number: 4
  - Area: 640 acres
  - Volume: 1,320 mg
  - BOD Loading
    - Non-Canning Season: 5 lbs BOD_5/ac/day
    - Canning Season: 90 lbs BOD_5/ac/day
  - Detention Period
    - Non-Canning Season: 57 days
    - Canning Season: 23 days
- Digestion Tanks
  - Number: 3
  - Total Volume: 235,000 cf
  - Unit Solids Loading
    - Non-Canning Season: .04 lb/cf/day
    - Canning Season: .25 lb/cf/day

Advanced Waste Treatment

- Chemical Treatment - Peak Rates

Square Tanks	
Number	2
Length-Width	70 ft
Volume (each)	0.51 mg
Surface Area	4,900 sf
Total Volume	3.38 mg
Total Surface Area	30,600 sf
Detention Time	
Canning Season	1.2 hrs
Non-Canning Season	3.4 hrs
Overflow Rate	
Canning Season	2,200 gal/sf/day
Non-Canning Season	800 gal/sf/day

Secondary Treatment	
Trickling Filters	
Type A	
Number	3
Diameter	166 ft
Depth of Media	4.2 ft
Volume of Media (each)	90,000 cf
Volume of Media (total)	270,000 cf
Hydraulic Capacity (each)	10 mgd
Type B	
Number	3
Diameter	166 ft
Depth of Media	24 ft
Volume of Media (each)	520,000 cf
Volume of Media (Total)	1,540,000 cf
Hydraulic Capacity (each)	24 mgd

STATE OF CALIFORNIA—RESOURCES AGENCY RONALD REAGAN, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD—
CENTRAL VALLEY REGION

3201 S STREET
SACRAMENTO, CALIFORNIA 95816
PHONE: (916) 445-0270
452-3977

30 October 1973

Mr. Thomas Dosh
City Engineer
City of Stockton
46 West Fremont, City Hall
Stockton, California 95202

Subject: Stockton Northwest and San Joaquin County's Lincoln Village Maintenance District Wastewater Treatment Plants

Dear Mr. Dosh:

On 12 October 1973 our Staff Engineers, L. A. Moldenhauer and G. E. Schmidt met with you and engineering representatives of the City of Stockton and the County of San Joaquin to discuss problems in preparing project reports for subject municipal wastewater treatment plants. These plants are both included in the Priority Class "C" Group for 1973-74 Clean Water Grant Projects. Project reports for these two projects must be completed and submitted no later than 1 January 1974.

This pre-project report conference was also attended by representatives of the Federal Environmental Protection Agency, the State Water Resources Control Board and the San Joaquin Local Health District. State and Federal representatives outlined their respective areas of concern and it appeared the conference helped the applicants by providing early direction for compliance with the State Board's 1973-74 Project Report Guidelines, first available on 10 October 1973.

In accord with our Staff Engineers' verbal agreement to provide the Regional Board's staff draft of probable waste discharge requirements, we submit the following specifications and provisions:

"It is hereby ordered, that the Stockton Northwest Plant discharge shall comply with the following:

A. Discharge Specifications

1. The discharge shall not cause a pollution.

2. Neither the discharge nor its treatment shall cause a nuisance.

3. The undiluted discharge shall not contain constituents in excess of the following limits:

Constituent	Units	30-Day Average	Monthly Median	7-Day Average	Inst. Maximum
a. B.O.D.(1)	mg/l	20		30	40
	lbs/day	300		450	
b. Settleable Solids	ml/l	0.1			0.2
c. Suspended Matter	mg/l	20		30	40
	lbs/day	300		450	
d. Coliform Organisms	MPN/100 ml		23		500
e. Oil and Grease	mg/l				10
f. Chlorine Residual	mg/l				0.1

(1) 5-day 20°C Biochemical Oxygen Demand

4. The discharge shall not have a pH of less than 6.5 nor greater than 8.5, nor shall it cause a change greater than 0.5 in the pH of the receiving waters.

5. Survival of test fishes in 96-hour bioassays of the undiluted discharge shall be no less than:

Minimum, any one bioassay ---------- 70%

Median, any three consecutive bioassays ----- 90%

6. The discharge shall not cause the dissolved oxygen concentration of the receiving waters to fall below 5.0 mg/l.

7. The discharge shall not cause concentrations of materials in the receiving waters which are deleterious to human, plant, animal, or aquatic life.

8. The discharge shall not cause the turbidity of the receiving waters to increase by more than 10 percent above background levels.

9. The discharge shall not cause visible oil, grease, scum, or foam in the receiving waters.

10. The discharge shall not cause esthetically undesirable discoloration in the receiving waters.

11. The discharge shall not cause taste or odor in the receiving waters.

12. The discharge shall not cause fungus, slimes, or other objectionable growths in the receiving waters.

13. The discharge shall comply with the following temperature limitations:

    a. The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than 20 Fahrenheit degrees.

    b. The discharge either individually or in combination with other discharges shall not create a zone, defined by water temperatures of more than one Fahrenheit degree above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of the main river channel at any point.

    c. The discharge shall not cause a surface water temperature rise greater than four Fahrenheit degrees above the natural temperature of the receiving waters at any time or place.

14. The discharge shall not cause the total nitrogen concentration in receiving waters to exceed 3.0 mg/l.

15. The discharge shall not cause the monthly Total Dissolved Solids (TDS) of receiving waters to increase above 500 mg/l, as measured on the basis of the average mean daily values for any calendar month.

B. Provisions:

1. The Stockton Northwest Wastewater Treatment Plant shall comply with the following time schedule to assure compliance with discharge specifications 3a through 3f, 5, 14, and 15:

Task	Completion Date	Report of Compliance Due
Submit Project Report	1 June 1974	15 June 1974
Complete Final Plans and Specifications	15 Sept. 1974	1 Oct. 1974
Begin Construction	1 Dec. 1974	15 Dec. 1974
Compliance with requirements	1 Dec. 1976	15 Dec. 1976

2. Compliance with specifications 1, 2, 4, and 6 through 13 inclusive shall be forthwith....."

The foregoing waste discharge requirements, drafted for Stockton Northwest, would also be applicable for Lincoln Village, excepting that the units of lbs/day under Specifications 3a and 3c would be increased about 10 percent, because these emission rates are predicated upon high monthly plant flows recorded during the past 18 months.

It should be recognized that the above tentative requirements are this staff's best guess at this time. There are two items, not yet resolved, which could result in changes to these proposed requirements. Since the Delta has been defined as a water quality limited segment, EPA will require a waste load allocation prior to issuance of a permit. The Basin Contractor is responsible for preparing this allocation. Also the Department of Water Resources has petitioned the State Board to review waste discharge requirements that this Board has adopted in the Delta. The Department would like to see more stringent controls on TDS in the discharge. We have indication that the State Board may soon consider this petition.

While the subject of waste load allocations and TDS limits remains unsettled, we feel the above tentative requirements are appropriate for use in compiling the required project reports.

We believe that an updated area-wide plan for the disposal of wastewater in Central San Joaquin County is needed. That plan should consider solutions and time schedules for solving a number of suspected problems in the area. The project report for the city Northwest Plant and the county Lincoln Village Plant could be the beginning of

a joint cooperative effort. These two project reports must consider the impact each has on the other. That study we believe could best be accomplished by a joint effort of city and county people and their engineers.

Our staff would be pleased to discuss this further with you.

Sincerely,

W. H. Crooks for

JAMES A. ROBERTSON
Executive Officer

GES/eh

cc: Charles Wong, Director
San Joaquin Co. Dept. of Public Works

Les Delbon, St. Water Resources Cont. Board

Clair Hill & Associates, Attention Bob Harding